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FIRECODE

Nucleus Fire Precautions Recommendations

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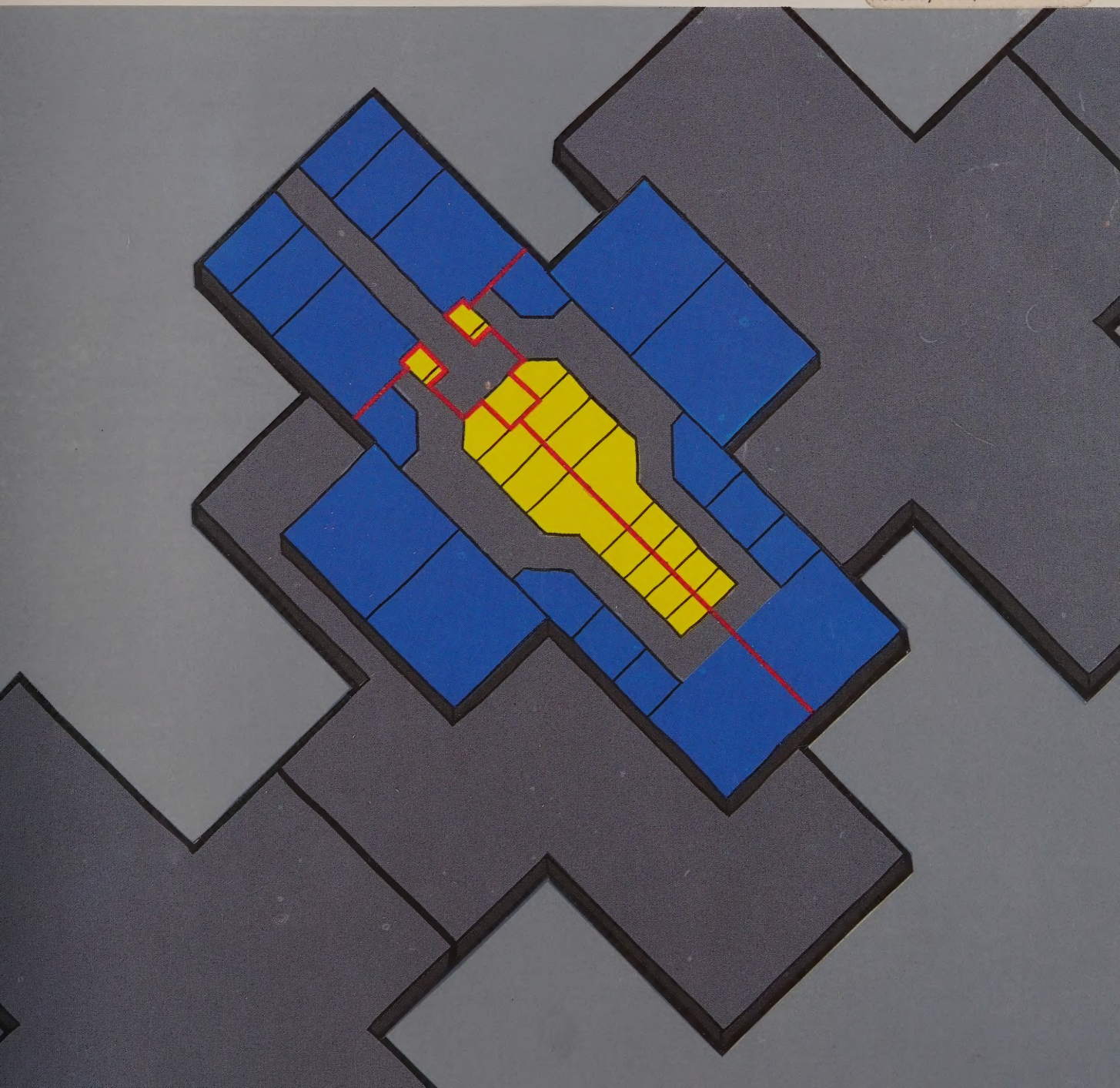

Department of Health
and the Welsh Office

FIRECODE

Nucleus Fire Precautions Recommendations

LONDON HER MAJESTY'S STATIONERY OFFICE

FIRECODE brings together in one comprehensive suite of documents the Department's policy and technical guidance on fire precautions in hospitals and other NHS premises.

Basic policy, principles and key management guidance are contained in Firecode: Policy and Principles. Other FIRECODE documents include the Health Technical Memoranda '80' series (which give technical guidance on various building, engineering and equipment issues) and the Fire Practice Notes series (dealing with various specialist aspects of the fire precautions) and Nucleus guidance. Existing HTMs will, in due course, be reissued in FIRECODE format. The suite includes Firecode: Directory of Fire Documents which lists references to relevant legislation and relevant fire precautions guidance issued by non-DH sources (as, for example, the Home Office).

For the convenience of the user, a FIRECODE binder and slip case are available for the storage of the constituent FIRECODE documents. The binder includes details of the publications which make up FIRECODE. The FIRECODE binder, reference ISBN 0 11 321097 3, is available from HMSO Books, PO Box 276, Nine Elms Lane, London SW8 5DT.

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Preface

The Nucleus Fire Precautions recommendations 1st Edition dated February 1979 was published at the start of the Nucleus programme. Since then, the major significant developments of the system by:-

a. growing number of projects completed and in planning stages;

b. 600-bed model;

c. low energy hospital study reports;

d. larger size and updated departments;

e. publication of FIRECODE/Health Technical Memorandum 81;

f. The Building Regulations 1985;

g. publication of Nucleus Design;

h. publication of Nucleus Users' Guide;

i. publication of Nucleus Designers' Handbook; and

j. publication of Project Information Bulletins Nos 1 to 19

have generated a need for a new edition of this guidance document.

This 2nd Edition supersedes and incorporates, either in this text or in Appendix 5, the relevant fire precautions guidance previously contained in the:-

Nucleus Fire Precautions recommendations 1st Edition; and Project Information Bulletins Nos 5, 6, 10, 11, 14, 16, 19, 21 and 22.

This document has been jointly produced by the Health Building Directorate of the Department of Health (HBD-DH) and the Home Office Fire Service Inspectorate. (HOFSI)

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Introduction

Purpose of this Document

This document is intended to assist health authorities and others when considering the use of Nucleus design material for a new hospital development.

It is recommended that all members of the project/design/commissioning and in use management teams who are responsible for providing and maintaining fire precautions in a Nucleus hospital should read this document, and ensure that the day to day use of facilities does not negate fire safety.

This document is intended to explain the background to and the constraints of the means of escape/fire planning on the design of the Nucleus system.

Scope

The scope of this document is limited to the means of escape/fire evacuation strategy and related matters in a Nucleus hospital. For structural and fire construction standards please refer to Building Regs 1985 and the relevant Approved Documents - see also Appendix 4.

Attention is drawn to the fact that effective application of the fire safety precautions depends on efficient day to day hospital management (See Section 7).

This guidance is effective from the date of publication and will apply to all Nucleus designated projects which have not reached the detailed design stage. The decision on the application of the 1st or 2nd Editions Nucleus Fire Precautions recommendations to a specific project will rest with the Regional Health Authority.

Other References

This document forms one section of the Department of Health (DH) FIRE CODE which is the Department's formal guidance on all fire matters. It should also be read in conjunction with the other Nucleus documents eg:

a) Nucleus design which explains design strategy.

b) 'The Nucleus Users' Guide' which provides general background, and details of DH/NHS liaison, information services and available documentation.

c) The Nucleus Designers' Handbook.

d) 'Nucleus Policies and Designs' which contains summarised versions of whole hospital and departmental policies and plans.

e) Nucleus Standard Fire Plans for 300/600 bed models and 1:50 scale plans for individual hospital departments.

An up-to-date list of Nucleus documentation is issued periodically in the Nucleus Projects Information Bulletin, and other relevant DH publications are listed in the latest Works Guidance Index.

HTM 81 November 1987

DH published HTM 81 'Fire Precautions in new Hospitals' in November 1987. It sets down general principles and recommendations for guidance in the layout, design and construction of new (non-Nucleus) hospital buildings, extensions and major alterations to ensure safety of the occupants in the event of fire.

HTM 81 underlines the need for a flexible application of the principles incorporated in it in order to achieve buildings with reasonable conditions for escape which are compatible with the design and user requirements.

Nucleus Fire Precautions Guidance

This Nucleus Fire Precautions Recommendations document has been developed in parallel with HTM 81. It follows the principles contained in that document, highlighting the most significant parts of the DH fire planning strategy, and relates the principles and recommendations to the specific design and operational requirements of Nucleus.

The recommendations contained in this document have been evolved in the context of Nucleus model hospital 1 and 2 development control plans and the agreed 1:50 standard fire plans as listed in Appendix 2. The guidance in HTM 81 should be followed in areas of a hospital not covered in this document e.g. fire brigade access, car parking, fire hazard rooms etc.

The Department has consulted with the Home Office Fire Service Inspectorate (HOFSI), the Department of the Environment Building Regulations Division and the Fire Research Station in the initial development of the Nucleus hospital design and its component parts. Projects which use standard Nucleus principles and fire plans are covered by agreements between the HOFSI and DH, provided that the project is designed in accordance with this document. Modification of the standard package may well nullify the agreements reached with HOFSI.

For consultation procedures with local fire authorities - see Appendix 1.

Fire Precautions Legislation

Building Regulations cover structural fire precautions but they provide limited guidance on means of escape in hospitals. Although hospitals have yet to be designated under the Fire Precautions Act 1971 the Department has sought to follow the spirit of the Act in developing fire precautions guidance for hospitals.

Implementation of the recommendations contained in this document should result in standards which will allow fire certification to proceed without difficulties should hospitals be designated in future under the Fire Precautions Act 1971.

Building Regulations 1985 and Related Approved Documents

In accordance with DH policy, Nucleus projects, together with all other health buildings, are required to comply with Building Regulations. Where Project teams require interpretations of the Approved Documents, case studies can be raised at Regional level with the Building Legislation Working Group in accordance with the practice for other projects. Where 'Approved Documents' are quoted herein, this should be taken as relating to the Building Regulations.

Determination of and dispensation from Building Regulations are dealt with by RHAs. Health Authorities should follow Health Circular (88) 60 entitled Building Legislation Compliance Procedures.

Construction Standards

For the construction standards which satisfy the Nucleus fire precautions strategy see Appendix 4.

Project Application Procedure

For details see Appendix 1.

The Standard Nucleus Design

Background

Nucleus was developed in 1975 using a model hospital functional content based on the requirements of a real Health District which was deemed to be sufficiently typical.

The model hospital referred to above was termed Nucleus design example 1. See figure 1. This model provided a context for demonstrating the viability of the system in terms of both design and cost. It also proved to be a valuable tool for whole hospital policy research, low energy studies and the development of fire precautions guidance.

Building Form

The building form comprises an assembly of standard cruciform templates which are capable of being arranged horizontally and vertically to form a low rise hospital with landscaped courtyards providing good natural light and ventilation. Communication between departments for people, goods and building services is provided from a hospital street.

Nucleus Design Example 1.

The major components of Nucleus design example 1 are:-

(1) Cruciform shape clinical template as a standard fire compartment

(2) Service block with space separation from (1)

(3) Hospital street zone with service ducts and vertical communication shafts containing stairs/lifts in courtyards

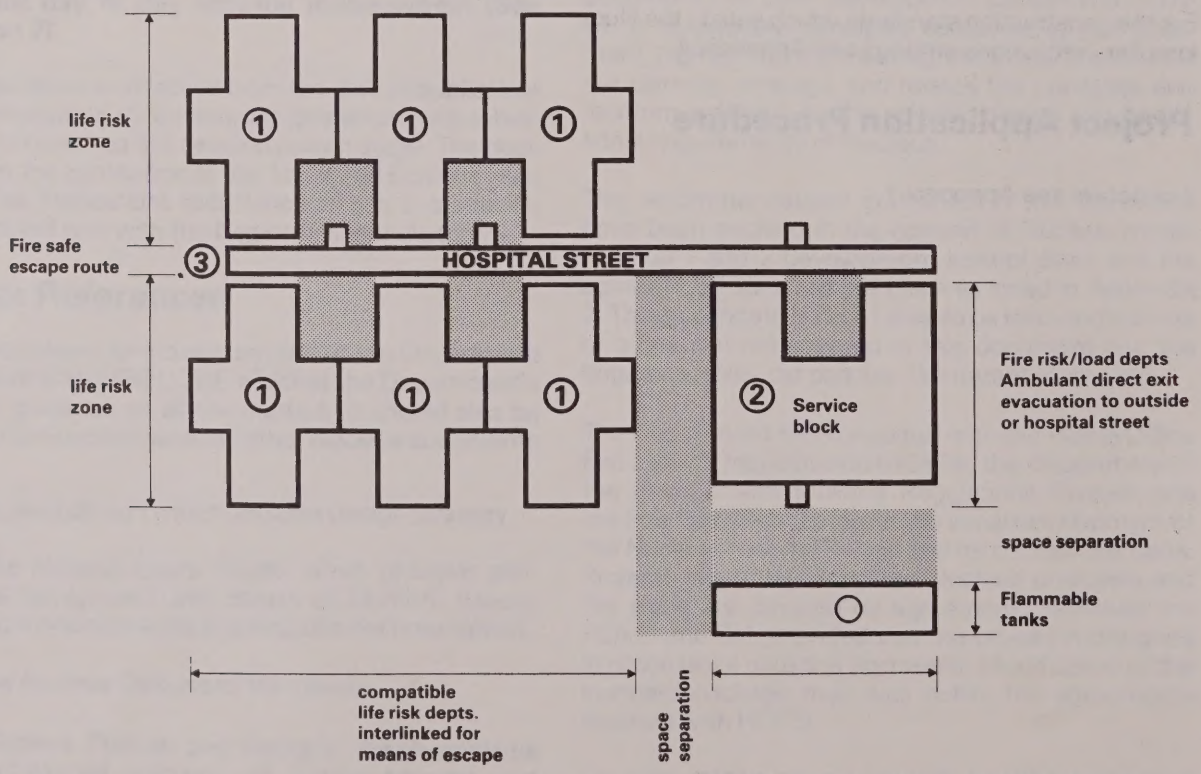


Fig 1. Nucleus Design Example 1 **300 Bed: First Phase: 2 Storey**

Highlighting major features affecting Fire Precautions

Nucleus Design Example 2. 1985

Since the work was concluded on design example 1 many other developments have taken place which have necessitated the production of Model 2 which illustrates a 600 bed DGH built in phases.

The major components of Nucleus design example 2 are:-

(1) Cruciform shape clinical templates as a standard fire compartment.

(1a) Extended clinical templates as a fire compartment

(1b) Pod zone

(2) Support service L shape templates and deep plan departments as fire compartments with space separation.

(3) Hospital street zone with service ducts and vertical communications via protected shafts in pods or courtyards.

(4) Engineering plant

(5) Service street linking (2) (3) & (4) above.

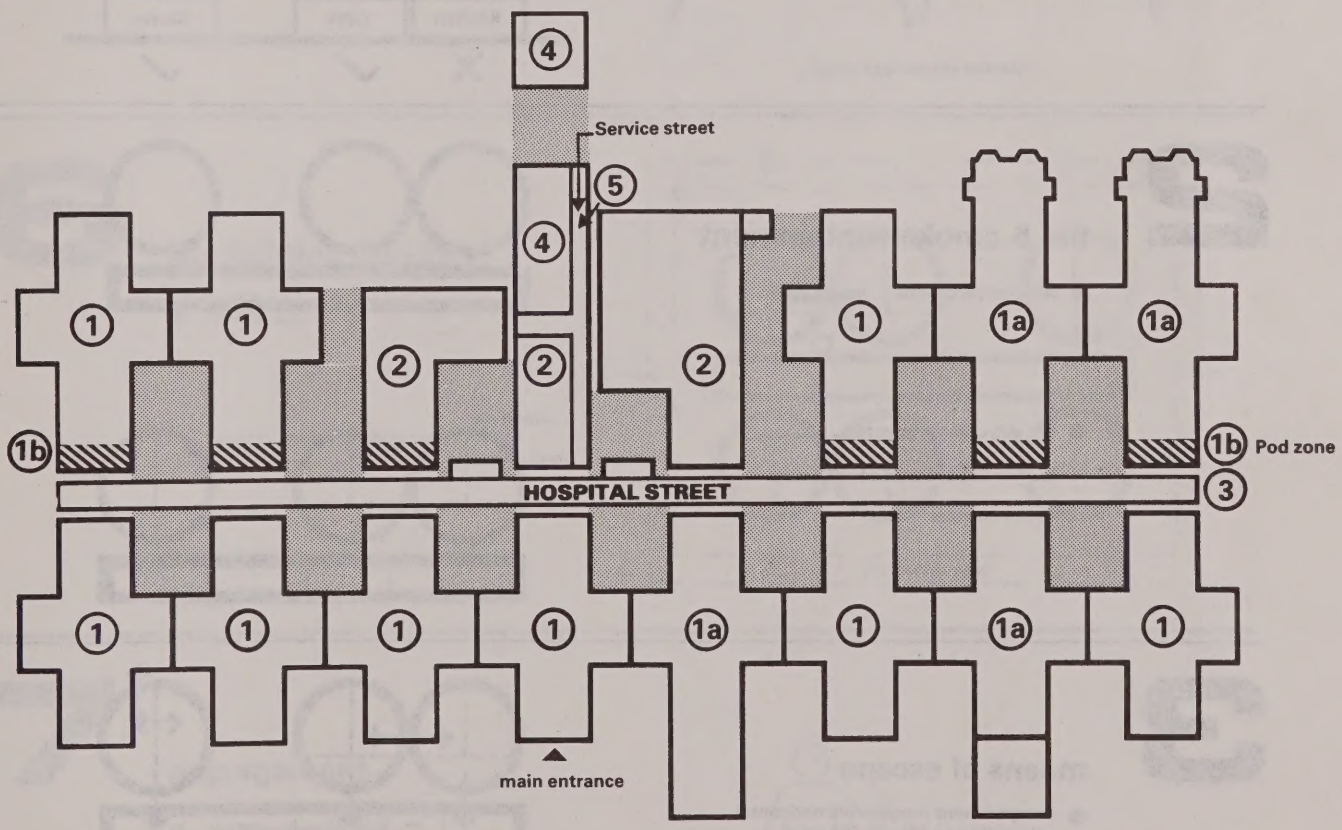


Fig 2. Nucleus Design Example 2 **Ground Floor Plan.** **600 Bed: 2 Storey**

Highlighting major features affecting Fire Precautions

Note: for details of Compartment outline in Pod zone see Appendix 5.

Nucleus Fire Planning Concepts

The primary objective of fire precautions provisions is to provide safety from fire and smoke as an integral part of the Nucleus hospital design system.

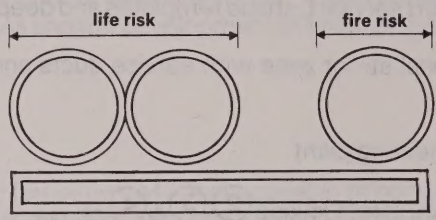
In devising the fire precautions strategy the aim is to save life, not necessarily to protect the property. The design strategy assumes that there will be only one fire at a time within the hospital complex and provides for the control and containment of a fire as well as safe evacuation of patients and other personnel.

The 7 major principles which enable this primary objective to be achieved are:-

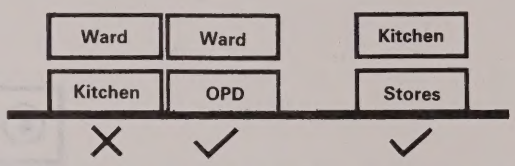
- Separation of risks
- Fire and smoke containment
- Means of escape
- Detection/Alarm
- Smoke ventilation/Dispersal
- Fire fighting provision
- Management

1 separation of risks

- separation between fire and life risks horizontally

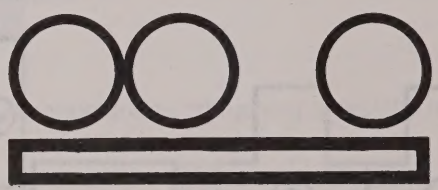


- separation vertically



2 fire & smoke containment

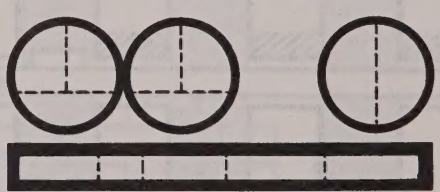
- fire compartments



- fire sub compartments _ _ _ _ _

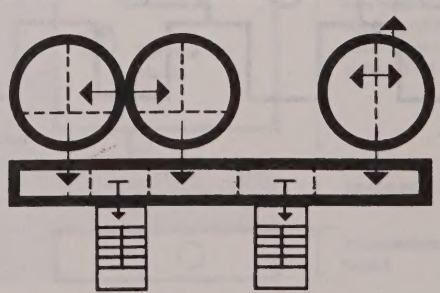
fire risk/load hazard containment

cavity barriers



3 means of escape

- compartment progressive horizontal evacuation and travel distances
- hospital street - horizontal & vertical evacuation



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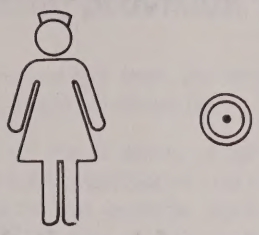
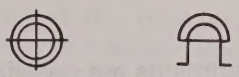
detection/alarm

- staff/patient



- automatic

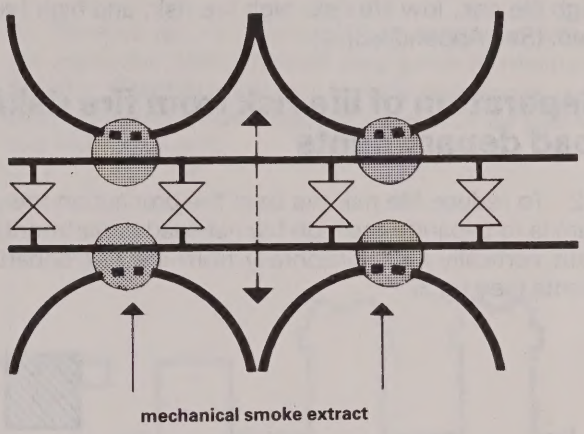


5

smoke ventilation/dispersal

- control of smoke by natural means

- control of smoke by mechanical means



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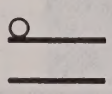
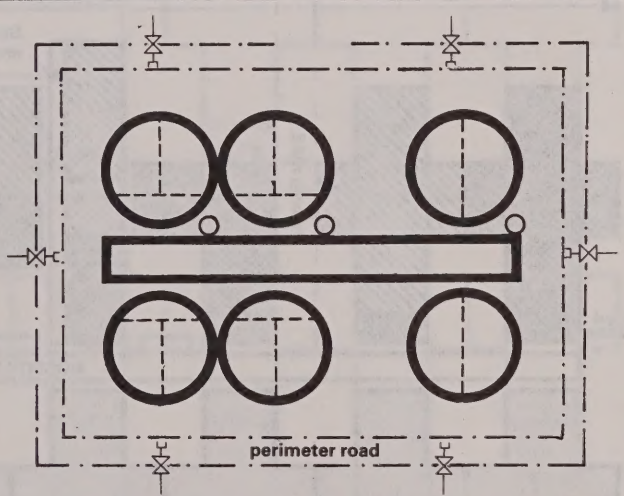
fire fighting provision

- site access

- hospital street & stairways



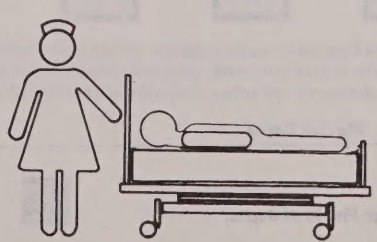
- hydrants etc.



7

management

- maintenance in use
- staffing requirements for evacuation
- training
- change of use



1. Separation of Risks

Risk categories of hospital departments

1.1 Hospital departments are classified in HTM 81 into risk categories. These are:

High life risk; low life risk; high fire risk; and high fire load. (See Appendix 3).

Separation of life risk from fire risk/load departments

1.2 To reduce life risk the best fire precaution measure is to separate the high fire risk/load departments both vertically and horizontally from life risk departments (see fig 3).

1.3 The main objective of this separation between risk categories is:-

If any fire occurs in a fire risk/load department, it should not necessitate the evacuation of life risk departments. The separation should also enable the fire brigade to contain and extinguish the fire.

1.4 Thus Pathology (high fire risk) and Sterilising/Disinfecting Unit (high fire risk and load) should be separated from high life risk departments such as wards. Separation is best achieved by leaving space between departments, but in some cases either the interposition of low life risk accommodation such as administration or imperforate wall separation may be acceptable.

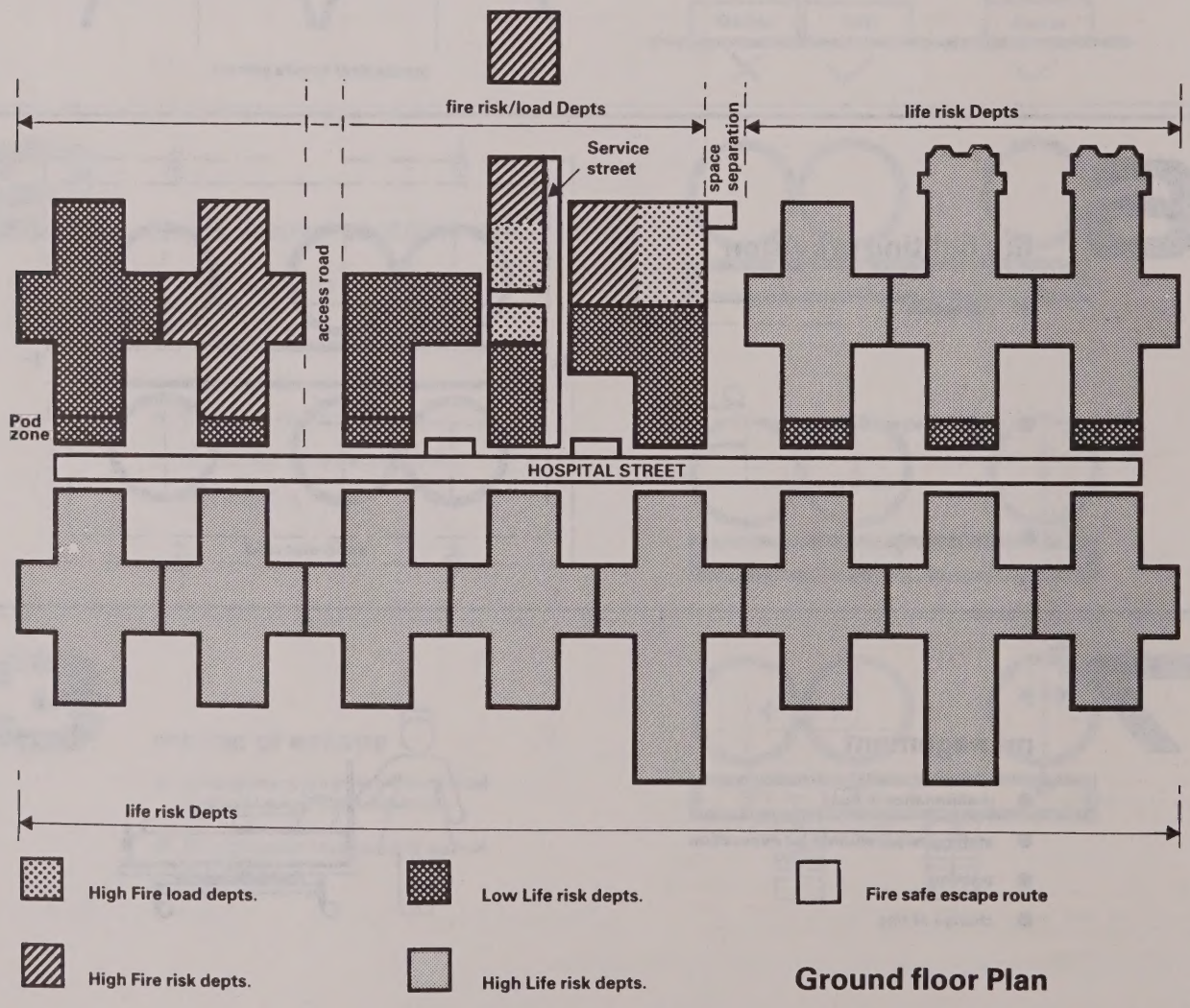


Fig 3. Separation of life risk and fire risk/load departments

1.5 The concept of horizontal evacuation of necessity means grouping together life risk departments which can be interlinked for means of escape. This, however, restricts the location of associated fire risk/load hospital departments (eg pharmacy, pathology, catering) which should not be interlinked with life risk departments.

1.6 A hospital street sub-compartment must not give access to departments with incompatible risk categories. The separation of a risk department from the hospital street can be achieved by either:

a) Space separation; or

b) The interposing of low life risk accommodation between the risk department and the hospital street; or

c) An imperforate compartment wall interfacing the street.

Engineering provision

1.7 Reduction of risk from the engineering plant and services has been achieved by:

a) location of major items of services equipment in plant rooms situated above the hospital street, or in discrete buildings remote from fire risk/load and patient areas.

b) the routing of the main engineering services within or above the hospital street.

c) each compartment will have a means of isolation at the template/hospital street interface.

d) services (except drainage) are contained within the particular compartment they serve to minimise structural penetrations; in non-life risk zones, services penetration of structural slabs may be permitted (see figs 4 & 5).

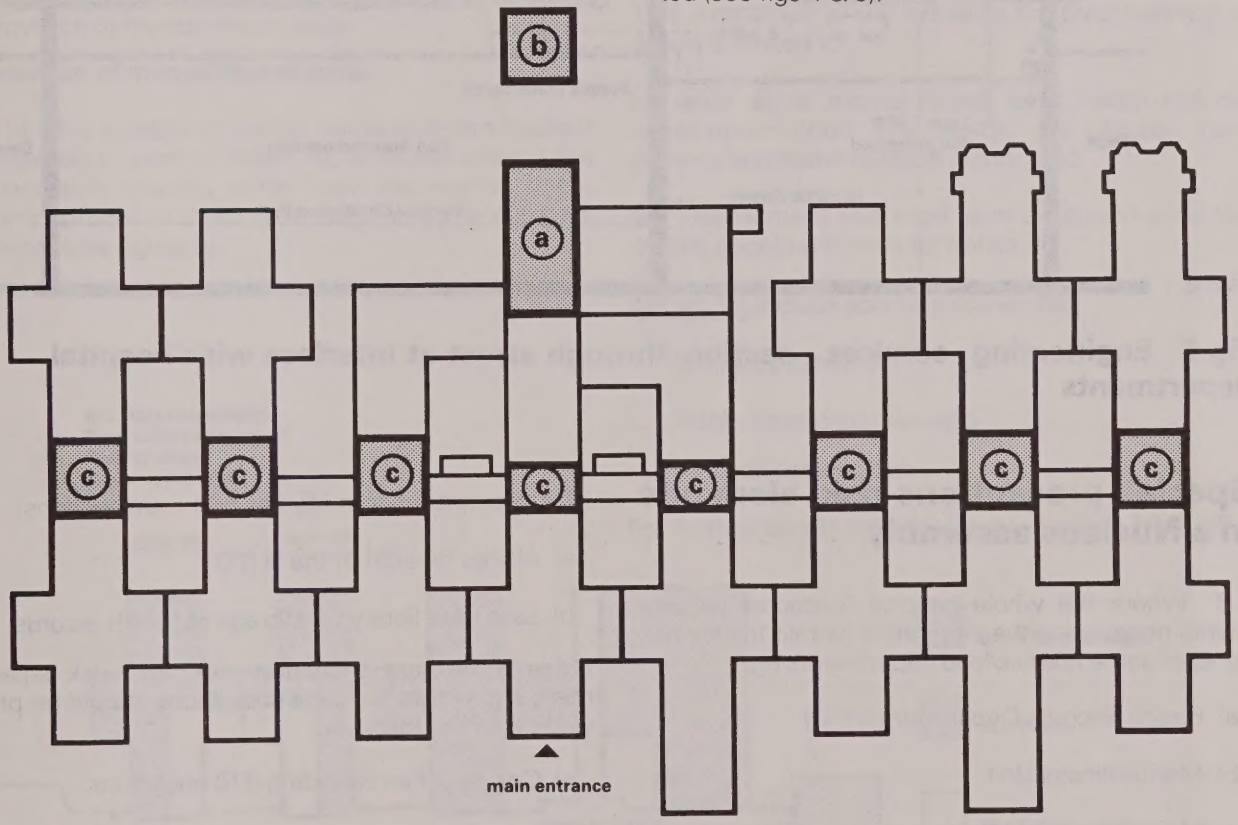


Fig 4. Plant rooms location and fire separation

(a) An energy centre integrated with the hospital and located close to the 'centre of gravity' of the development to ensure short distribution routes for mains. This is usually provided as an interlinked series of spaces on several floors housing energy generation plant, switch gear and hot and cold water storage in various forms.

(b) A detached plant area at ground level in close proximity to the energy centre, housing the high voltage/electrical intake, standby generators, transformers, medical gas stores and flammable liquids store.

(c) Rooftop plant rooms situated above the interfaces between street and departments allowing decentralisation of air handling plant and very short distribution routes for ductwork.

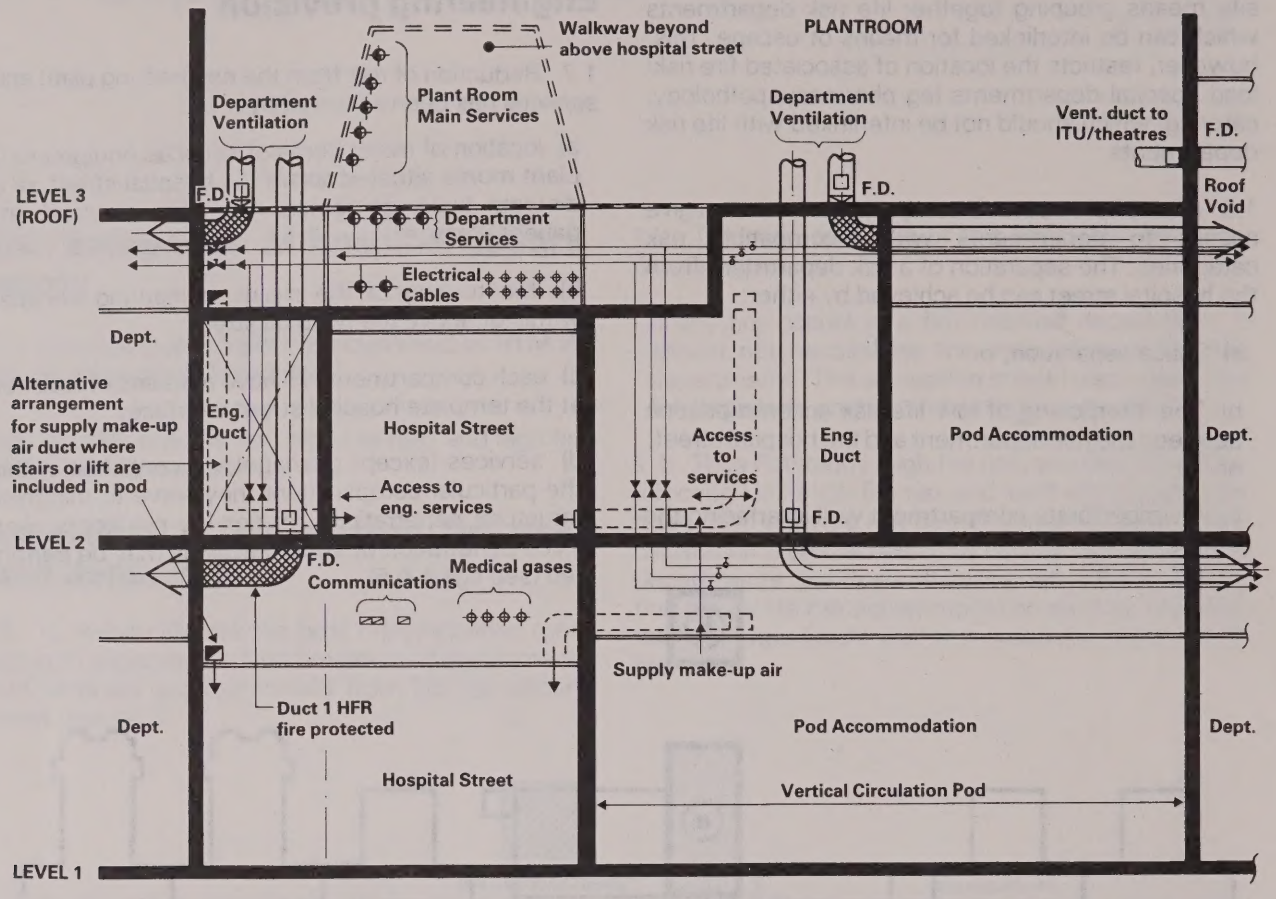


Fig.5 Engineering services - section through street at interface with hospital departments

Special precautions-risk elements in a Nucleus assembly

1.8 Where the whole hospital functional requirements necessitate the integration (within the life risk zone) of some fire risk/load departments eg:

a) Health Records Department (HRD)

b) Mental Illness Unit

c) Main Entrance containing shops, cafeteria etc

d) Wards for the Elderly - (see Section 3).

the following additional guidance on the location of the above departments has been agreed.

Health Records Department

1.9 In standard Nucleus design example 1, the essential current health records area (eg as shown on standard fire plans of OPD and X-ray) has been provided with a half hour fire resisting enclosure, the main case note library (record store) being located in the service block.

1.10 For guidance on Health Records Department see Health Building Note 47.

This department normally has two main sections:

a) offices for staff of the H R D

b) case note library for storage of health records

If this department is situated under a life risk department e.g. wards the case note library should be provided with the following:

a) One hour Fire Resisting (FR) enclosure;

b) Automatic detection;

c) Automatic fire extinguishing system;

d) A smoke dispersal system (under local fire authority control);

e) Storage racking/shelves which are all compatible with the selected automatic extinguishing system;

f) A reduced fire load by using metal storage systems.

1.11 If the case note library has an external wall directly below an in-patient department the following criteria should apply to the external wall:

a) One hour FR ;

b) No openings

or

c) If glazed, fixed, one hour FR (integrity only). Doors to be one hour FR (integrity only).

1.12 Adequate means of escape from within the main case note library must be provided. Due to the constant flow of staff and trolleys, doors may be held open by detents.

Accommodation for mental illness units

1.13 The Nucleus fire precautions recommendations (February 1979) were developed primarily for an acute 1st phase clinical hospital. In response to user needs, these recommendations now include guidance on the provision of mental illness units.

Location of mental illness units

1.14 The location of mental illness units in a Nucleus assembly should not inhibit the horizontal progressive evacuation strategy either from the mental illness compartment or from other adjoining fire compartments (see figure 6).

1.15 Nucleus Project Information Bulletin No. 18 section 3 describes the current advice on the location of MI units in a Nucleus hospital:

'A psychiatric unit for acute patients being provided in a district may be on or off the district general hospital site - this is a decision for local management to make. Where the unit is on the general hospital site it is suggested that it should preferably be a separate building with a separate entrance and be on the ground floor. If a separate building is not possible then it should be at the periphery of the hospital development (i.e. a Nucleus end condition) with direct access on to usable open space. But ideally it should be planned as an autonomous unit with easy access to catering and other services and diagnostic and treatment departments. If it is to be on two-storeys, wards may be on the first floor but the day hospital should always be on the ground floor'.

The Scope

1.16 The scope of the following fire precautions guidance is limited to:

a) Adult acute mental illness units which include Assessment Short Stay wards, day hospital, outpatients and administration suites; and

b) Assessment and short term treatment units for elderly people with mental illness.

It does not include accommodation for:

long stay patients

alcohol and drug misusers

regional secure units

For further details refer to Health Building Note 35.

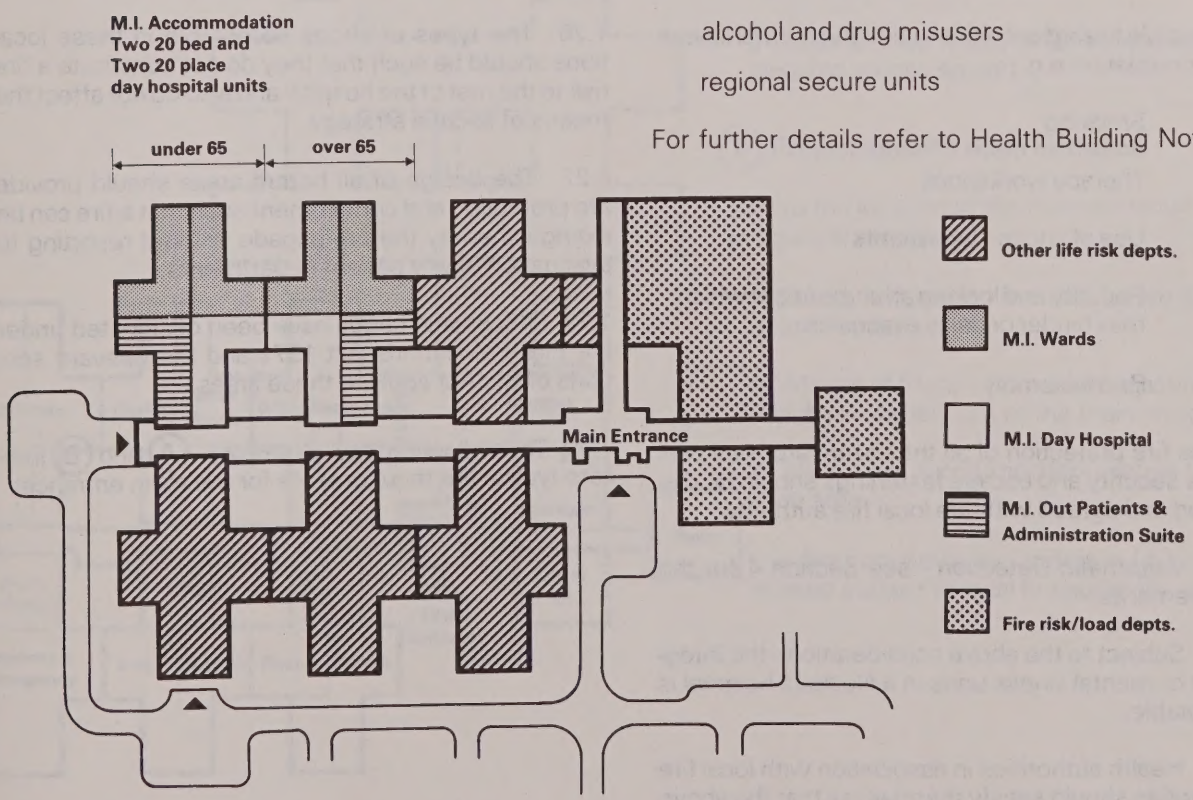


Fig 6. Typical location of mental illness units in a Nucleus D.G.H., Phase 1, Ground Floor

Note

If the under 65 unit is located off-site, the unit for over 65 would move to the end location.

Patient Category

1.17 The District Health Authority should confirm to the local fire authority that the type of patients to be accommodated will not compromise the Nucleus horizontal evacuation strategy i.e.:

a) Patients are able to join in the progressive horizontal evacuation; and

b) They will not hinder or disrupt evacuation to or from the adjoining compartments.

In-patient accommodation - staffing requirements.

1.18 It is assumed that the maximum size of a ward will not exceed 25 patients and will be provided with the minimum staffing level of not less than two staff per ward at night in accordance with Nucleus Basic Assumptions stated in Section 3.

1.19 If any secure single rooms are provided, staffing levels should be such as to ensure that the immediate evacuation of patients from these rooms is feasible without impairing or delaying evacuation of other patients in the unit.

Additional considerations

1.20 The following major fire precautions aspects will need specific consideration:

a) Possible arson/accidental risk

b) Possible hazard activities within the mental illness accommodation e.g.:

i. Smoking

ii. Therapy workshops

iii. Use of kitchen by patients

iv. Security and locking arrangements which may hinder or delay evacuation

v. Bed assembly

c) The fire protection of all the hazard areas as well as the security and escape fastenings should be discussed and agreed with the local fire authority.

1.21 Automatic Detection - see Section 4 for the requirements.

1.22 Subject to the above considerations the integration of mental illness units in a Nucleus hospital is acceptable.

1.23 Health authorities in association with local fire authorities should satisfy themselves that the above considerations do not invalidate Nucleus fire precautions. If agreement cannot be reached, the mental illness units should have space separation from all other life risk departments.

Main entrance accommodation

1.24 In large size Nucleus developments this accommodation is provided in either

(A) A template or part of a template; (see figure 7.)

or

(B) A project specific building shape; (see figure 8.)

1.25 Where this accommodation is located within the life risk zone and contains limited fire risk/load areas e.g. 3 to 4 shops, the following fire planning aspects must be considered and agreed with the local fire authority:

a) the area occupied by shops should not exceed 15% of the template compartment.

(Where the total floor area exceeds 15% of the template, the provision and location of the shops should be reviewed and agreed specifically at the initial stages with the DH & HOFSI).

b) compartments.

c) sub compartments.

d) separation from hospital street.

e) protection to hazard areas.

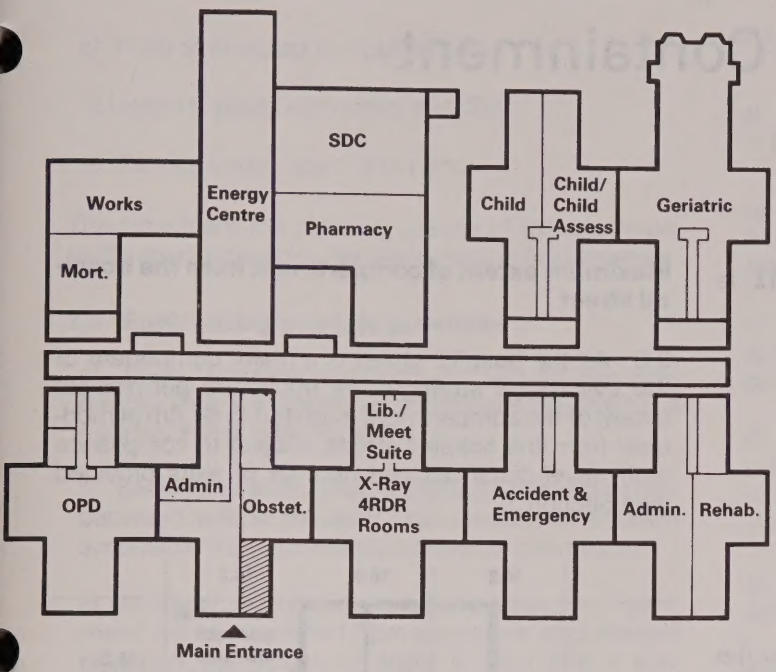
f) vertical shafts, stairs/lifts to upper floors.

1.26 The types of shops acceptable in these locations should be such that they do not constitute a fire risk to the rest of the hospital and also do not affect the means of escape strategy.

1.27 The design of all hazard areas should provide fire protection and containment such that a fire can be extinguished by the fire brigade without resorting to evacuation of any patient departments.

1.28 Offices and shops have been designated under the Fire Precautions Act 1971 and the relevant sections of the Act apply to these areas.

1.29 The following two examples (A) and (B) indicate typical fire requirements for the main entrance:



▨ **shops - area limited to 15% max. of plan area of template/compartment**

Fig 7. Main Entrance in a template with wards above.

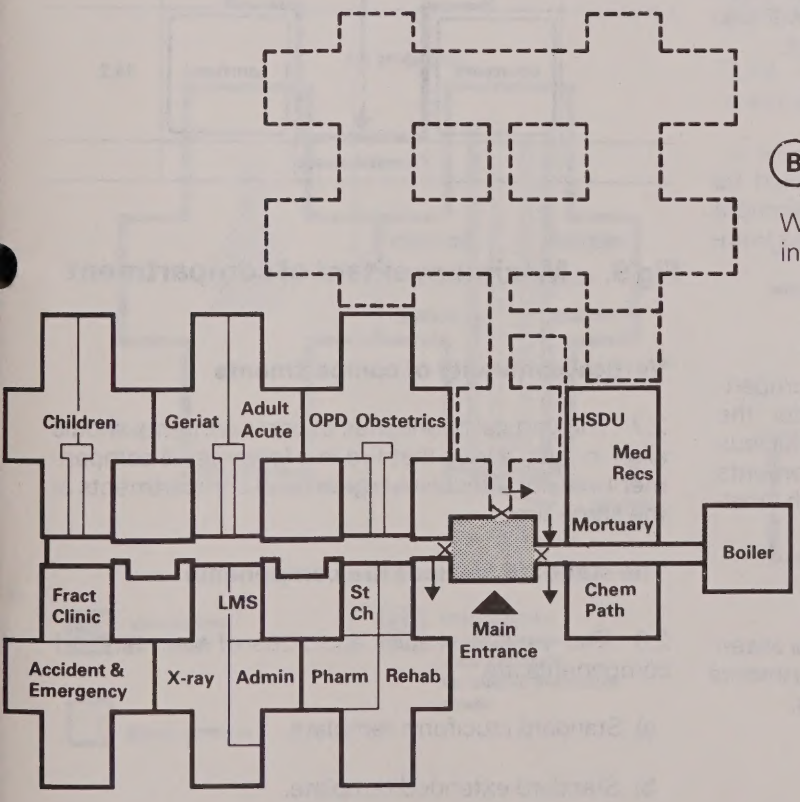


Fig 8. Main Entrance with space separation from clinical depts. and low life risk dept. over, eg. Education/Administration.

(A) Main Entrance in Template (Within the life risk zone)

In this example it is essential that:-

a) The whole template should form a compartment.

b) One hour FR separation from the hospital street must be maintained.

c) There should be no vertical shafts within the compartment eg accommodation stairs.

d) Each hospital department contained within this template should form a sub-compartment.

e) Travel distances and exit route widths should be in accordance with Section 3.

f) All shops which are assessed as hazard areas by the local fire authority should be enclosed and fire protected and have independent means of escape without passing in front of the shops.

g) Provision of automatic detection and extinguishing systems to hazard areas should be in accordance with local fire authority advice.

h) All shops must comply with B.S. 5588 part 2.

i) Subject to circumstances and liaison with the local fire authority, external walls of shops may need to be one hour FR (see para 1.11).

j) Internal shop fronts must be enclosed to reduce possible smoke spread.

(B) Project specific Main Entrance

Where the location of the main entrance (as indicated in figure 8) provides:

a) Space - separation from all the life risk accommodation.

b) Means of Escape from each adjacent life risk zone which is independent of the main entrance area.

c) No patient accommodation above the main entrance area.

the fire requirements stated in (A) above may be relaxed subject to local fire authority advice.

2 Fire and Smoke Containment

2.1 **Fire and smoke containment** is achieved by:

a) Compartmentation.

b) "Sub" compartmentation.

c) Cavity barriers.

d) Fire protection of hazard areas.

e) Engineering services provision.

For staff-assisted horizontal evacuation strategy the following parameters for the above components have been agreed in the Nucleus design system.

Nucleus compartments and building geometry

2.2 A building shape with an alternate courtyard pattern (within a master grid of 16.2 metres) provides a fire compartment geometry which will facilitate fire containment as well as reduce the possibility of external fire spread. The courtyard configuration will also assist smoke clearance from the compartment.

Compartments

2.3 The integrity of fire compartments should be such as to allow for the full one hour fire containment within the compartment where a fire originates without affecting adjacent compartments.

Maximum size

2.4 The maximum permissible area for a compartment in multi-storey hospital buildings under the Approved Document B2/3/4 is 2000 m^2. The Nucleus building geometry and travel distance requirements generally limit the compartment size to a much smaller area. (See paragraph 2.6)

Compartments/hospital departments

2.5 For staff assisted evacuation strategy it is essential that fire compartments and/or sub-compartments should correspond with hospital departments.

Maximum extent of compartment from the hospital street

2.6 As the hospital street is a major component of the evacuation strategy, the maximum permissible extent of the compartment is limited to 64.8m (4 modules) from the hospital street, subject to compliance with travel distances and number of exits provided (see Section 3).

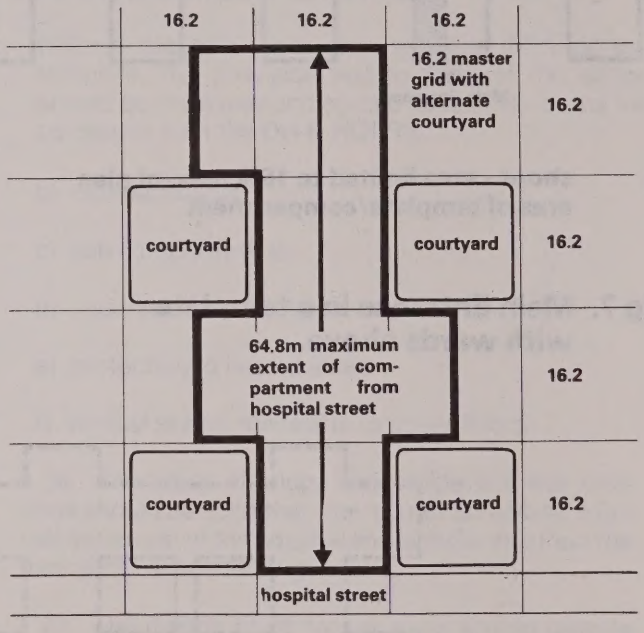


Fig 9. Maximum extent of compartment

Vertical continuity of compartments

2.7 The vertical boundaries of compartments should align in such a way that fire in a lower level compartment will not affect two higher level compartments at the same time.

The standard Nucleus fire components

2.8 The various shapes and sizes of the standard components are:

a) Standard cruciform template.

b) Standard extended template.

c) Pods to standard templates.

d) Hospital street with stairs and lifts.

e) Service street, stairs and ramp.

The significant fire planning criteria of these components are contained in the green pack of fire drawings.

2.9 **Engineering services provision**

a) Each template compartment will be serviced directly from vertical service ducts located within the hospital street (see figure 10.)

b) Each service entering or leaving a template compartment will be provided with a means of isolation accessible from the hospital street or plant room.

c) All services (except drainage) within a compartment will be down fed from a services void created between the structural soffit or roof and a suspended ceiling.

d) No service (except drainage) will communicate vertically or horizontally with another compartment except via the hospital street.

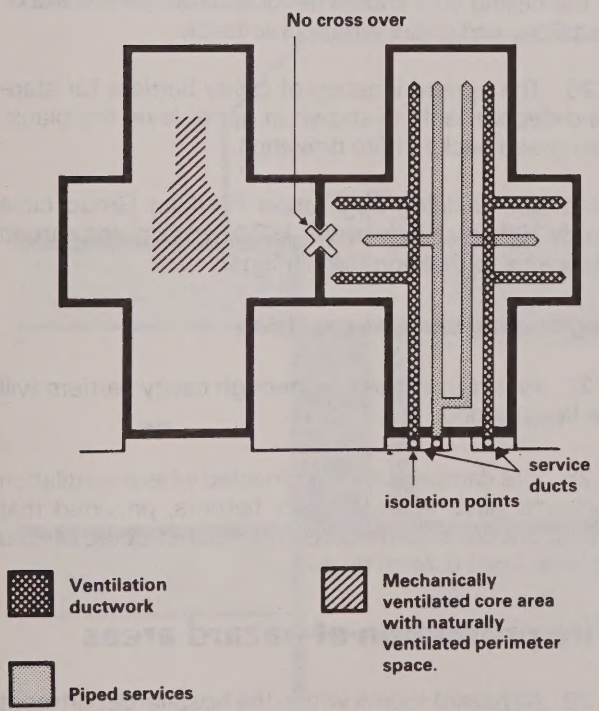


Fig 10. Engineering services to a standard template/compartment

2.10 **Compartment walls**

a) All services passing through a compartment wall to be fire stopped to one hour FR.

b) Services routed within the cavity created by studding and plasterboard should not compromise the fire integrity of the wall.

c) Chasing of block walls to install services is acceptable provided fire resistance of the wall is not compromised.

d) Supply and clean extract ventilation systems will have automatically controlled fire dampers fitted, with fusible links, linked to the compartment fire alarm system.

e) Dirty extract ventilation systems will have fusible link operated fire dampers.

Sub-compartments

2.11 The limited staff availability during the initial fire stage precludes the possibility of evacuating a whole fire compartment within an acceptable period of time.

2.12 To gain sufficient time for initial evacuation from the area of the fire, fire compartments should be subdivided into sub-compartments or protected areas to allow staged evacuation (see figure 11 and Section 3 Means of Escape.)

2.13 Each sub-compartment must be designed to meet all of the following fire-planning aspects:

a) Number of staff available at the initial fire stage.

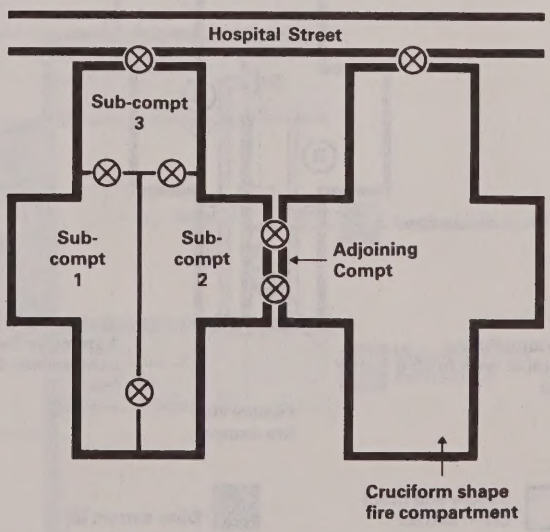


Fig 11. Typical sub-compartments within a compartment.

b) Number of non-ambulant patients that the available staff will need to evacuate.

c) Space available within adjoining sub-compartments.

2.14 To reduce the possibility of rapid smoke spread from in-patient rooms into circulation spaces, smoke stop walls and doors to these rooms should be provided.

2.15 Sub-compartmentation may also be necessary to achieve permitted travel distances (see Section 3) and provide alternative escape routes.

2.16 When a Nucleus template/compartment contains a number of small departments, each small department should correspond with the sub-compartmentation.

2.17 Generally sub-compartments should be to half hour FR standard but some hospital departments may need one hour FR standard e.g. ITU department.

Engineering services provision

2.18 Services passing through half or one hour FR sub-compartment walls will be fire stopped to the same standard.

2.19 All ventilation systems which pass through one hour FR sub-compartment walls will have fusible link operated fire dampers.

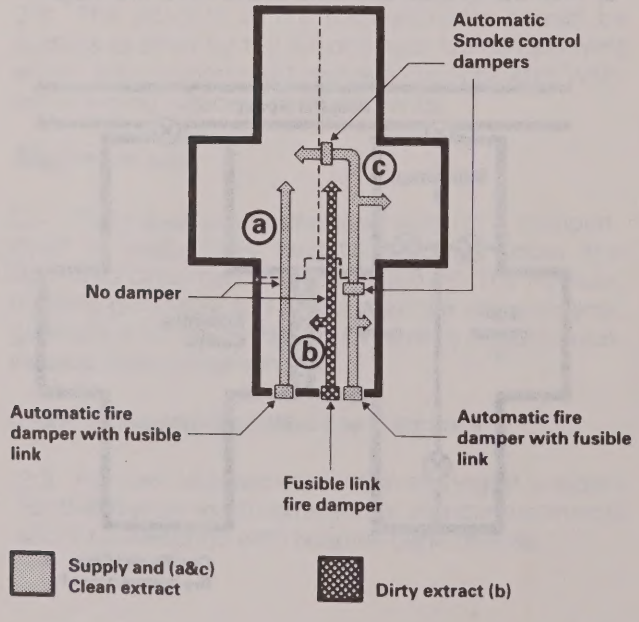


Fig 12. Routing of ventilation services

2.20 Ventilation systems which pass through one or several half hour FR sub-compartments but serve only one sub-compartment will not require fire dampers at half hour FR sub-compartment walls (see figure 12.) provided that the ductwork is continuous and is constructed of mild steel at least 0.7mm thick.

2.21 Maintained dirty extract ventilation systems which have duty and standby fans and are fed from an essential electrical supply may serve several sub-compartments without the need for dampers at the half hour FR sub-compartment walls they cross.

2.22 Exceptionally, where supply and clean extract ventilation systems serve more than one sub-compartment, automatic smoke control dampers linked to the compartment fire alarm system are required in sub-compartment walls between the served sub-compartments to prevent smoke transfer when the systems are shut down.

Cavity barriers

2.23 These should be provided in the ceiling and roof voids in accordance with the Approved Document B2/3/4 - Appendix G.

2.24 The function of cavity barriers is to stop fire and smoke spread through voids and other spaces enclosed by building structures.

2.25 To meet this function effectively in standard Nucleus (which generally has a demountable suspended ceiling), it is recommended that cavity barriers in the ceiling void should be located above the line of partitions and doors where practicable.

2.26 The agreed location of cavity barriers for standard departments is shown in upper level fire plans. See green packs of fire drawings.

(See also Building Legislation Working Group case study 102 dated November 1986 which states agreed variations to Building Regulations).

Engineering services provision

2.27 All services passing through cavity barriers will be fire stopped.

2.28 Fire dampers are not provided where ventilation systems pass through cavity barriers, provided that the ductwork is continuous and is constructed of mild steel at least 0.7mm thick.

Fire protection of hazard areas

2.29 All hazard rooms within the hospital department e.g. cleaners, staff locker room, disposal, switch-gear, pantry, etc should be protected by providing half hour FR enclosure, for details see green pack of fire drawings volumes 1 and 2.

Engineering services provision

2.30 Main ventilation ductwork routes should not pass through fire hazard rooms. Where this is unavoidable and the systems serve other sub-compartments the ductwork will need to have a fire resistance equivalent to the hazard room.

2.31 Ventilation systems which directly service these rooms will not require the provision of fire dampers where they are fed from a maintained ventilation system, are of limited size (150mm diameter), and constructed in metal of a thickness greater than 0.7mm.

2.32 Air transfer grilles in the location as specified on the agreed fire plans are acceptable subject to the following conditions:

a) grilles to be fitted with fusible link dampers of appropriate fire resistance to BS 476 Part 8, 1972.

b) the grille does not exceed a maximum size of 200 x 200mm.

c) the room is normally held at a negative pressure in relation to the adjacent space (from which the air is drawn) by a maintained extract system.

d) the air transfer grille assembly is located within the fire resisting wall construction (not the door).

e) the air transfer grille is fitted with a suitable pressure relief flap as indicated in Project Information Bulletin No.21 (see Appendix 5.)

Hospital street

2.33 On each floor level the hospital street must:

a) Form one hour FR compartment.

b) Not contain any fire load except items in transit.

c) Be divided into sub-compartments. Each sub-compartment must be provided with either natural cross ventilation or mechanical smoke extraction - see Section 5.

d) Provide a link to escape stairs and lifts (from a sub-compartment of the hospital street which does not interface with a compartment exit).

e) Allow access to open air at ground levels.

f) Provide smoke controlled zones for escape and fire fighting.

g) Provide alternate courtyard pattern for fire separation between each compartment/street interface.

Engineering services provision

2.34 The main engineering services distributions will be routed horizontally above roof level or within the services void above each level of the street (see figure 13.)

2.35 Services to template compartments will be routed within one hour FR vertical ducts located at each street/compartment interface.

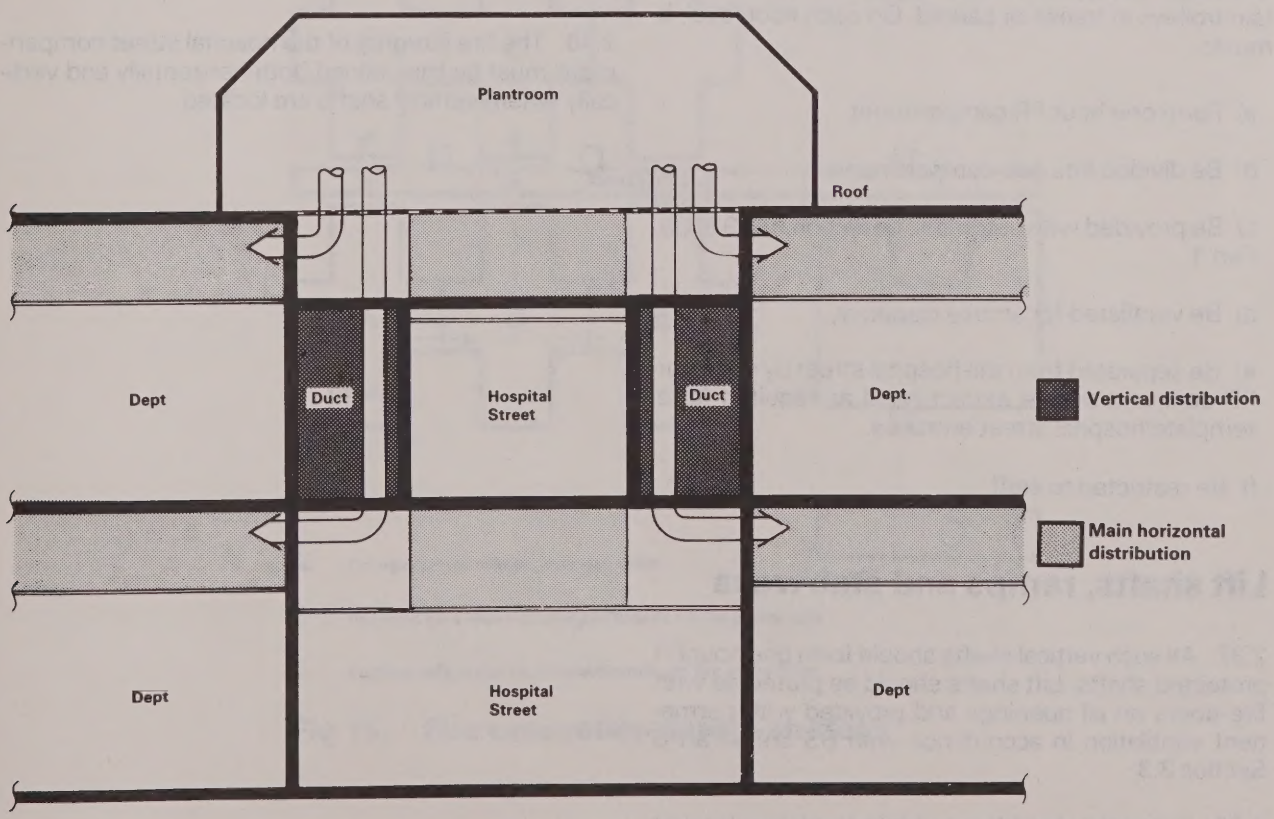


Fig 13. Main engineering services distribution

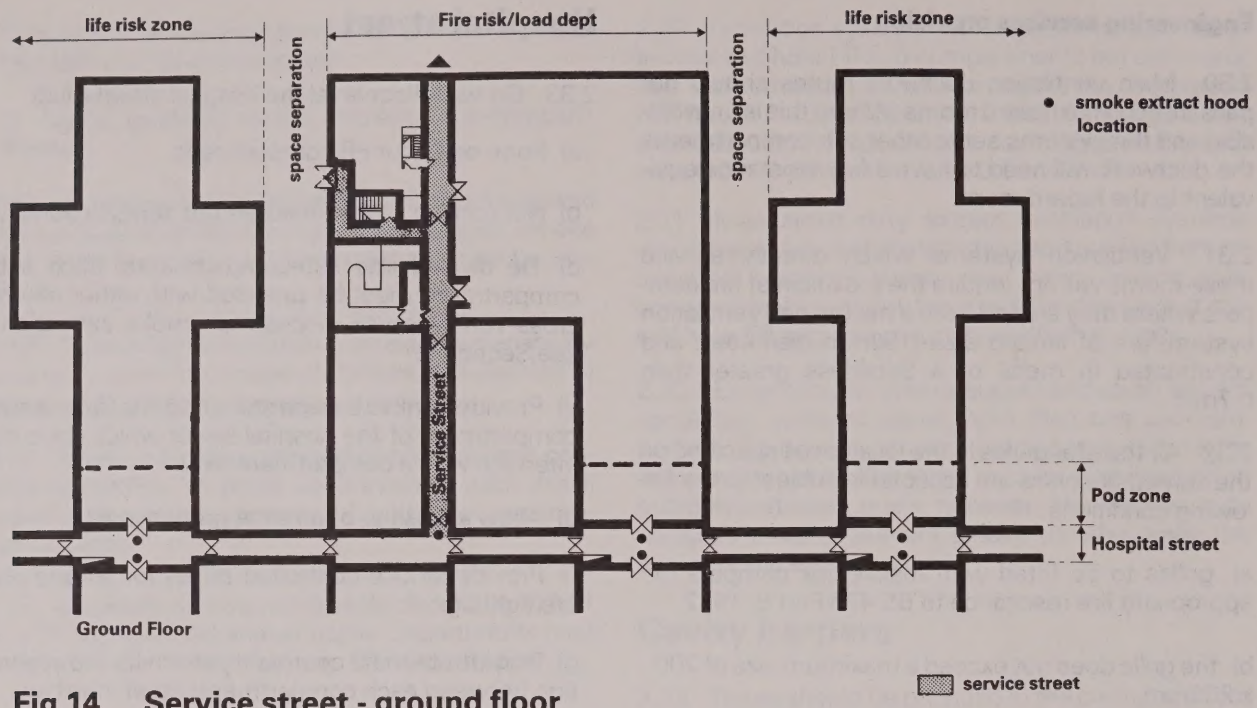


Fig 14. Service street - ground floor

Service street

2.36 A service street (see figure 14) is essentially a protected corridor providing access as well as means of escape to support service departments. It will contain trolleys in transit or parked. On each floor level, it must:-

a) Form one hour FR compartment.

b) Be divided into sub-compartments.

c) Be provided with automatic detection to BS 5839 Part 1.

d) Be ventilated for smoke dispersal.

e) Be separated from the hospital street by one hour FR door and smoke extract hood as required for a template/hospital street entrance.

f) Be restricted to staff

Lift shafts, ramps and stairways

2.37 All such vertical shafts should form one hour FR protected shafts. Lift shafts should be protected with fire doors on all openings and provided with permanent ventilation in accordance with BS 5655 Part 6 Section 3.3

2.38 Stairways should be protected with fire doors at each floor level and provided with permanent ventilation (see paragraph 3.21).

2.39 Services which pass through fire resisting construction of protected shafts or structural floors should be fire stopped to the same standard of fire resistance as the construction through which they pass.

2.40 The fire integrity of the hospital street compartment must be maintained both horizontally and vertically where vertical shafts are located.

3. Means of Escape

3.1 The aim when considering means of escape is to save life, not necessarily to protect property.

Basic assumptions

3.2 In devising the means of escape strategy the following basic assumptions have been made:

a) There will be only one fire at any one time within a hospital complex.

b) A fire will be effectively controlled and contained within the compartment/sub-compartment where it originated by virtue of:-

The organisation of fire emergency arrangements; the efforts of staff trained in fire drill; support from the local fire brigade.

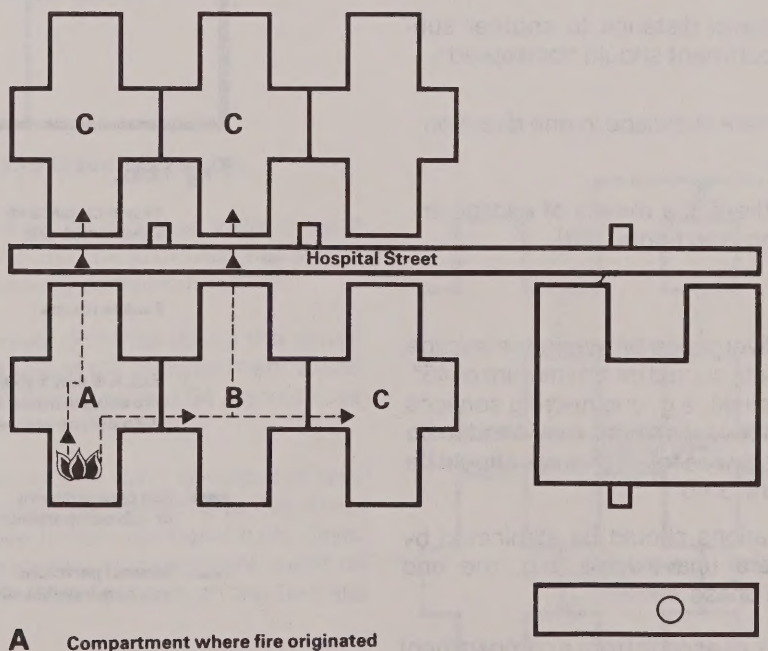
c) Fire compartments will be of adequate size to receive and hold those who are evacuated from the adjacent compartment where the fire originated.

d) There will be a minimum of 2 nurses on duty for each ward (not exceeding 28 beds) at all times and a proportion of patients will be ambulant (see Section 7.)

e) Construction standards will ensure compliance with all current statutory requirements.

Fire evacuation design strategy

3.3 The basic strategy for fire evacuation of non-ambulant patients in a low rise, multi-compartment Nucleus hospital is to move them horizontally from the compartment where the fire originated to adjoining fire compartments on the same floor.



A Compartment where fire originated

B Possible safe areas or compartments on the same floor

C Further safe areas or compartments on the same floor

Fig 15. Fire evacuation design strategy

Staged evacuation

3.4 Fire escape strategy is based upon staff-assisted evacuation. Staff or helpers will evacuate non-ambulant patients on their beds or in wheelchairs. Ambulant patients will be directed by staff as necessary. Movement will be primarily on the same floor from one fire compartment to another. The implications of this strategy, which become critical to life safety in a fire emergency, have been taken into account in the planning of the Nucleus hospital communication and circulation spaces and the associate design factors (e.g. type of bed, turning space required, door widths and directions of openings). For relevant ergonomic data refer to HBN 40 Vols 1, 2, 3 and 4.

3.5 The three stage evacuation procedure is as follows:

Stage 1 - evacuation from the sub-compartment where the fire originated to an adjoining sub-compartment or compartment or directly to outside.

Stage 2 - evacuation from the whole of the compartment where the fire originated to more distant fire compartments on the same floor level or directly to outside.

Stage 3 - evacuation to the outside of the hospital.

Means of escape and travel distances

3.6 The maximum travel distance to another sub-compartment or compartment should not exceed:-

a) 15 metres where there is escape in one direction only. (see figure 16A).

b) 32 metres where there is a means of escape in more than one direction (see figure 16B).

NOTE: The angle of divergence between the escape routes to alternative exits should be a minimum of 45°. In some fire risk/load areas, e.g. engineering services accommodation, the above distances may need to be reduced, and travel distances for such areas should be in accordance with para. 3.46

3.7 "Dead end" situations should be eliminated by planning except where unavoidable, e.g. the end template of a building phase.

3.8 Alternative means of escape from a compartment or sub-compartment should exit into an escape route which leads directly or ultimately to the hospital street or to outside and which does not lead back into the original compartment or sub-compartment.

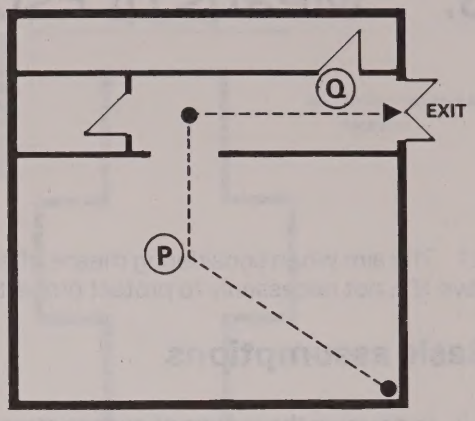


Fig 16A.

Travel distance (P)+(Q) **with only one direction escape not to exceed 15 metres.**

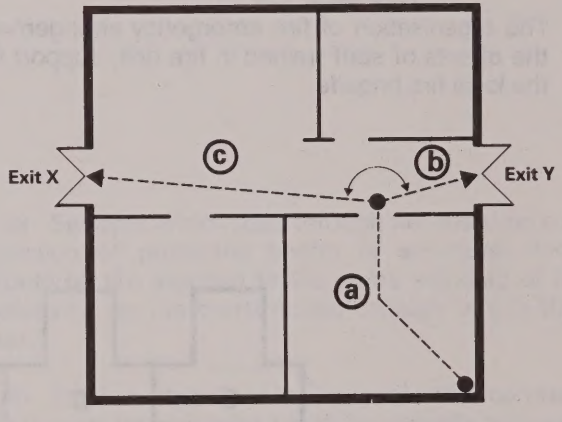


Fig 16B.

Travel distance to the nearest exit (a)+(b) **not to exceed 32 metres**

Escape routes (b) & (c) **minimum angle of divergence to be 45°**

Exit X & exit Y to link up with separate fire compartment or sub-compartments with escape routes leading to safe areas

Fire compartment or sub-compartment

Internal partitions non combustible construction

Figs 16 A & B Method of measurement of travel distance.

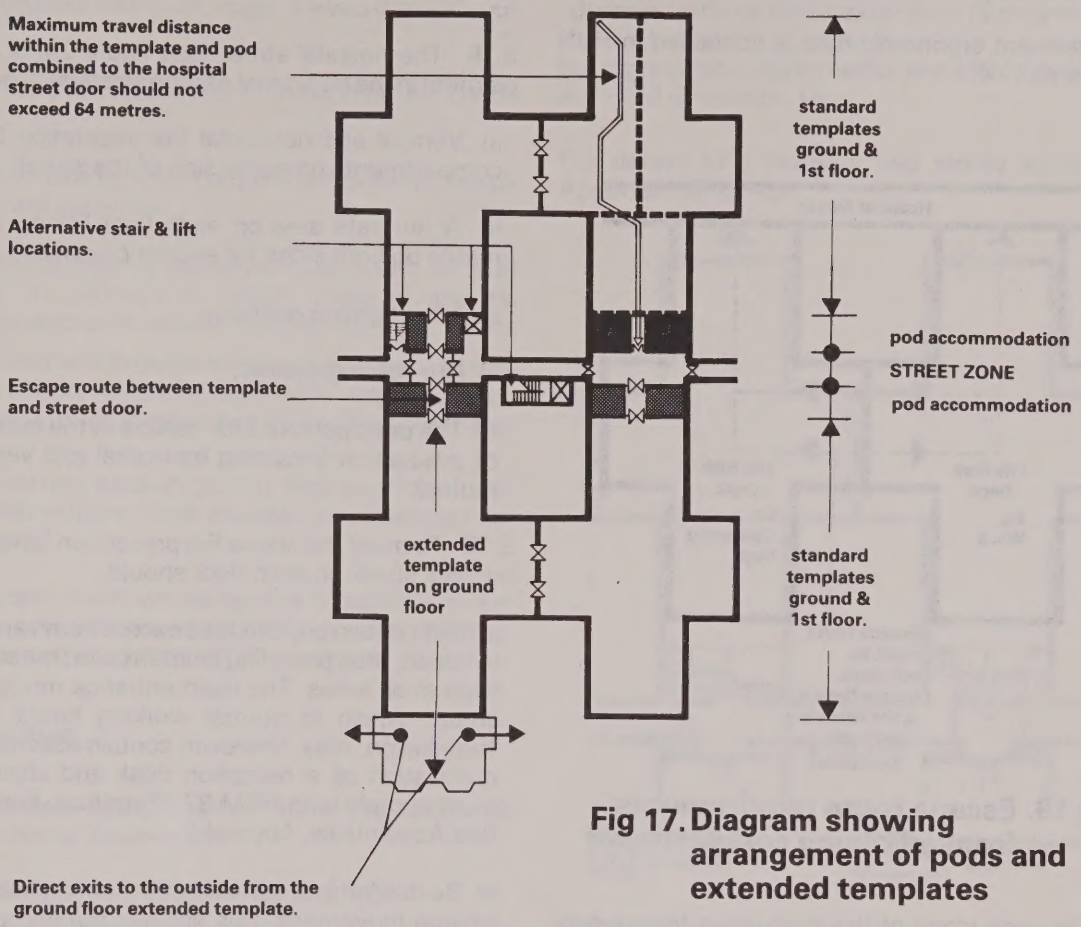

Maximum travel distance within the template and pod combined to the hospital street door should not exceed 64 metres.
Alternative stair & lift locations.
Escape route between template and street door.
extended template on ground floor
Direct exits to the outside from the ground floor extended template.
standard templates ground & 1st floor.
pod accommodation
STREET ZONE
pod accommodation
standard templates ground & 1st floor.

Fig 17. Diagram showing arrangement of pods and extended templates

Compartment exits and travel distances

3.9 A compartment must be provided with at least two exits, one of which must link to the hospital street and the other to an adjoining compartment.

3.10 The maximum travel distance (along the actual travel route) from any point in the compartment to the hospital street door must not exceed 64 metres (see figure 17.)

3.11 In extended templates with or without pod-zones, where the above travel distance to the street door cannot be complied with, additional exits direct to outside or to an adjoining compartment must be provided in the zone furthest away from the hospital street (see figure 18.)

3.12 For maximum extent of the compartment see paragraph 2.6- figure 9.

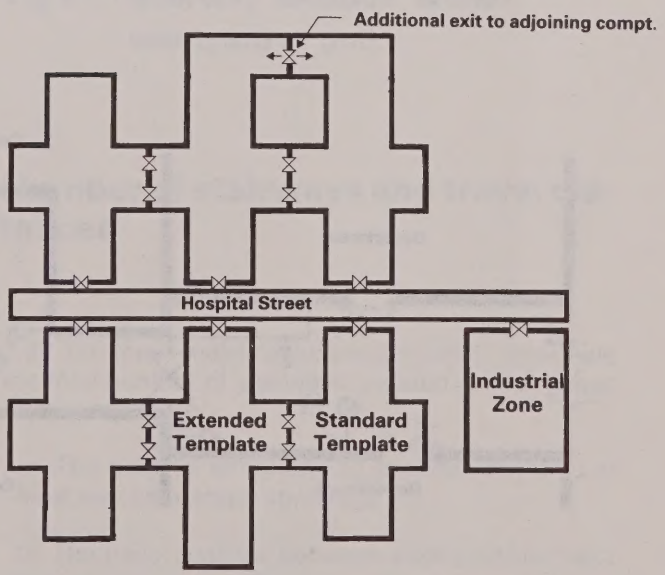


Fig 18. Design example 1 with extended templates.

Escape route space standards

3.13 Relevant ergonomic data is contained in HBN 40 Volumes 1 - 4.

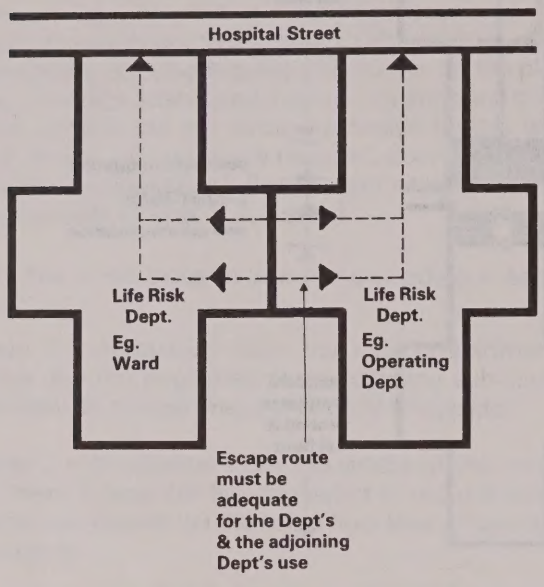

Hospital Street
Life Risk Dept.
Eg. Ward
Life Risk Dept.
Eg. Operating Dept
Escape route must be adequate for the Dept's & the adjoining Dept's use

Fig 19. Escape route requirements from adjoining compartment

3.14 For each stage of the evacuation from a sub-compartment the circulation spaces must be adequate for means of escape and provide temporary holding areas appropriate to the type of equipment used (see figure 19 and paragraph 7.10).

Hospital street

3.15 The hospital street (see figure 20) is a critical element in the horizontal escape strategy. It provides:

a) Vertical and horizontal fire separation between compartments on either side of the street;

b) A fire safe area on each floor linking compartments on both sides for escape purposes;

c) A fire fighting platform;

d) Fire fighting access;

e) The principal route for escape in the latter stages of evacuation (including horizontal and vertical exit routes).

3.16 To meet the above fire precaution functions the hospital street on each floor should:

a) Not contain any fire load except items and people in transit, thus providing uninterrupted means of passage at all times. The main entrance module of the street, which in normal working hours is under supervision, may, however, contain essential equipment such as a reception desk and chairs which must comply with HTM 87 "Furniture, Furnishings, Bed Assemblies, Apparel."

b) Be divided into sub-compartments to allow major escape movement. This enables the escape movement to bypass (if required) that section of the street linked to the compartment affected by fire;

c) Provide a link to independent vertical escape routes as well as access for firemen to each sub-compartment of the street;

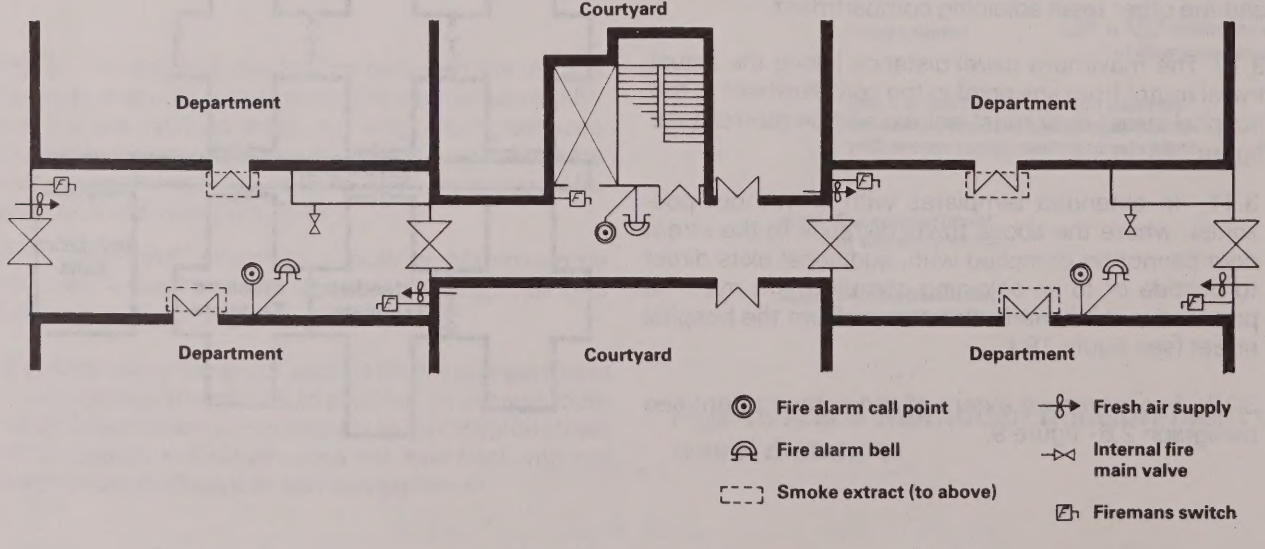


Fig 20. Typical hospital street layout showing engineering fire terminals

d) Provide access to the open air on the ground and lower ground floors for stage 3 evacuation to outside;

e) Provide a smoke free zone under initial fire conditions.

3.17 The following design requirements for the hospital street are essential:

a) It should have a minimum clear width of 3.00 metres, in addition to which there should be adequate approach spaces for lifts, stairs etc;

b) All doors which divide the hospital street into sub-compartments must be half hour fire resistance standard with detents linked to the fire alarm system;

c) All stairway exits at ground floor level must provide either exit directly to the open air or into the hospital street;

d) On upper floors where escape is possible in one direction only, the "dead end" of the street must be limited to one module in length.

Stairways

3.18 The three types of escape stairways used in the Nucleus Design System are:-

a) Stairways linked to the Hospital street.

b) Stairways linked to the Service street.

c) Interconnecting stairs within a Department (e.g. path lab on two floors).

Stairways linked to the hospital street

Location

3.19 Stairs and lifts must be accessible only from a hospital street sub-compartment which can be vented for smoke dispersal (see figure 21).

3.20 A sub-compartment of the hospital street which gives access to stairs or lifts must not contain any other compartment doors.

Fire Requirements

3.21 All such stairways must:-

a) Be enclosed in a one hour FR protected shaft following the guidance in Approved Document B2/3/4 Appendix E.

b) Be designed to permit unhampered mattress evacuation of patients.

c) Be provided with natural ventilation i.e. windows (with 1.2m² min area) at top and bottom of the protected shaft.

d) Be provided with half hour FR 1900mm wide doorset (without detents) on each floor landing.

For ergonomic requirements see HBN 40 volume 3 and HTM 81 section 18.

For details of a Nucleus two storey stairway see Appendix 5 P.67-68.

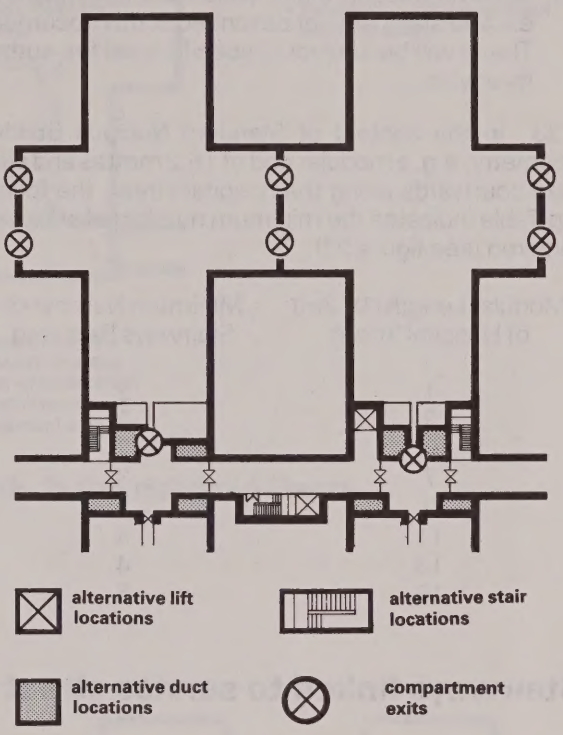


Fig 21. Stairway location within courtyard or pod

Number of stairways and travel distances

3.22 The three major requirements which determine the total number of stairways required in each phase of the project are:-

a) The hospital street should provide access to at least two fire escape stairways.

b) The travel distance between a compartment exit and entrance into the nearest escape stairway should not exceed 32 metres if alternative means of escape is provided and should not exceed 15 metres if the means of escape is in a single direction only.

c) Stairway entrances which serve the hospital street should be located not more than 64 metres apart.

NOTES:

(i) The above 3 requirements are identical with HTM 81 paragraphs 16.10 and 16.11.

(ii) It has been agreed with HOFSI that HTM 81 table to paragraph 18.7 is not applicable to designated Nucleus projects.

(iii) Accommodation stairs which are not means of escape stairs are not described in this document. These will be subject to specific local fire authority advice.

3.23 In the context of Standard Nucleus Building geometry, e.g. a modular grid of 16.2 metres and alternate courtyards along the hospital street, the following Table indicates the minimum number of stairways required (see figure 22).

Modular Length (16.2m) of Hospital Street	Minimum Number of Stairways Required
1	2
3	2
5	2
7	3
9	3
11	4
13	4
15	5

Stairways linked to service street

3.24 Stairs serving support service departments normally linked to a service street which are used only by staff for access and means of escape should conform with Building Regulations.

Interconnecting stairs within a department

3.25 Exceptionally in a department consisting of two storeys e.g. path. lab., an interconnecting stairway in accordance with Building Regulations requirement may be accepted subject to local fire authority agreement.

Means of escape interlink between life risk and fire risk/load departments

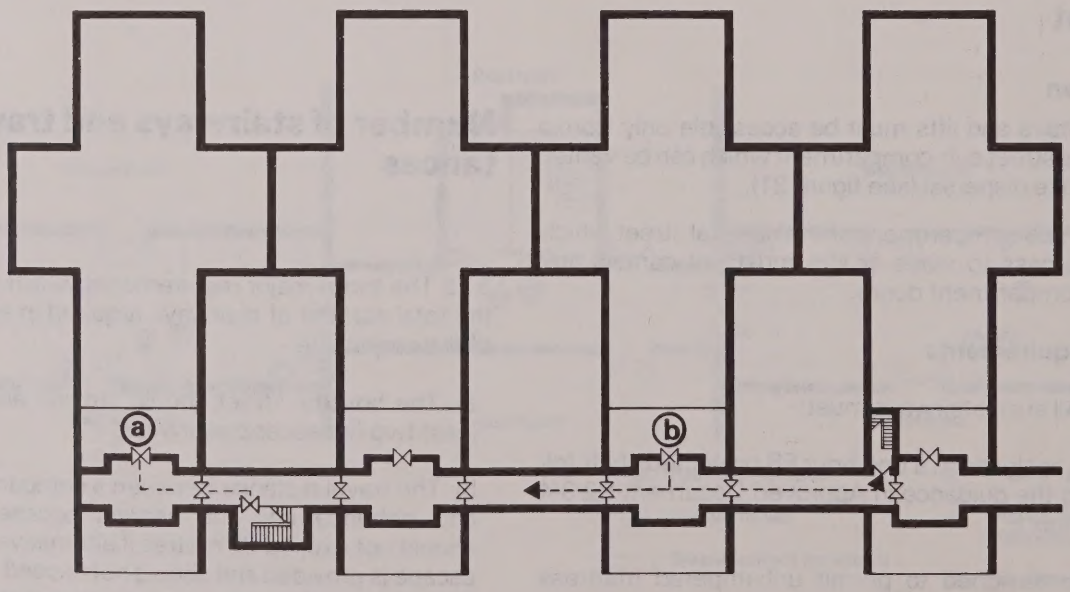
3.26 To meet the whole hospital functional requirements within a limited site and capital cost constraints, it may be necessary to locate a fire risk/load department e.g. path., pharmacy, staff change etc. within the life risk zone.

3.27 In these planning situations the following recommendations should be complied with:-

a) A fire risk/load department should be placed in an end location.

b) Reduction of the fire load e.g. reduce the holding of any flammables by frequent topping up.

3.28 Where an escape route from a life risk to a fire risk/load compartment is deemed acceptable this route through the fire risk compartment must be via a defined circulation space or a protected corridor (see figure 23).



(a) maximum travel distance to a stairway lobby in a single direction of escape - 15m

(b) maximum travel distance to the nearest stairway or alternative directions of escape - 32m.

Fig 22. Location of stairways along hospital street

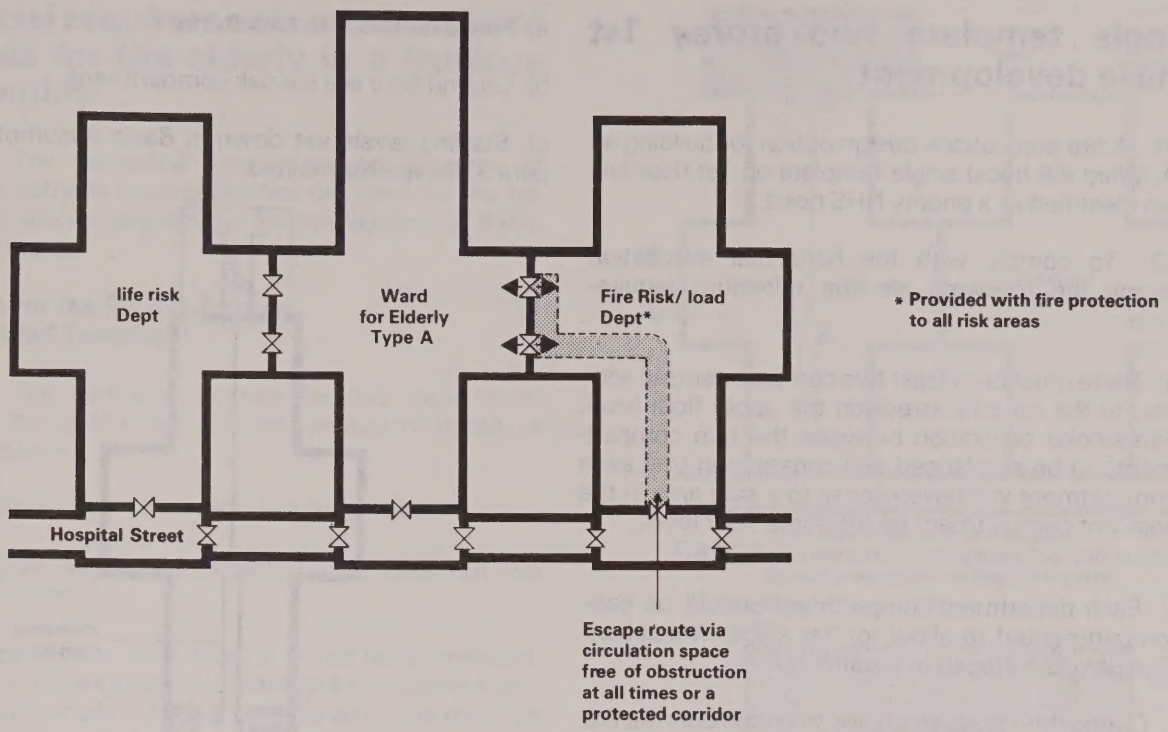


Fig 23. Escape route link between life risk & fire risk/load Depts

Minimum preferred 1st phase 2/3 storey development (see figure 24)

3.29 To meet the horizontal evacuation strategy the following are the minimum requirements:

a) There must be at least 2 compartments plus hospital street on each floor level.

b) Each compartment must have either a direct or via a protected corridor exit link to the hospital street.

c) Each compartment must provide an adequate safe holding area to its adjoining compartment for horizontal evacuation.

d) The hospital street must have:
a minimum length of 3 modules forming 3 sub-compartments
a courtyard interface to the central sub-compartment.

e) There must be at least two stairways.

3.30 Where this minimum preferred 1st Phase development is not feasible due to site/financial constraints, a 2-storey single template alternative 1st Phase development is acceptable and is described on the following page.

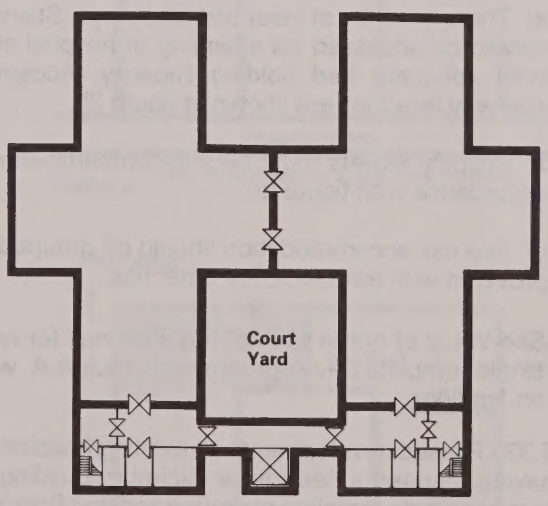


Fig 24.

Minimum preferred development with two standard template compartments

Single template two storey 1st phase development

3.31 A fire precautions design option for building an A.A. Ward (56 beds) single template on 1st floor has been identified as a priority NHS need.

3.32 To comply with the horizontal evacuation strategy the following are the minimum requirements:-

a) There must be at least two compartments in addition to the hospital street on the upper floor level. Fire/smoke separation between the two compartments to be so planned and constructed that each compartment will have access to a safe area in the adjacent compartment on the same floor level.

b) Each department/compartment should be sub-compartmented to allow for 1st stage evacuation. (See para. 3.4 staged evacuation).

c) During the 1st stage initial evacuation only the fire origin sub-compartment needs to be evacuated. The patients and staff evacuated from the fire origin sub-compartment must be accommodated in the adjoining sub-compartments which should have adequate capacity for holding them.

d) Each compartment must have either a direct, or via a protected corridor, link to the hospital street.

e) There must be at least two stairways. Stairways should be accessed via a landing or hospital street with adequate bed holding capacity. Acceptable stairway locations are shown in figure 25.

f) Hospital streets must be sub-compartmented in accordance with figure 25.

g) Fire risk accommodation should be grouped and provided with automatic fire detection.

See Vol. 2 of green pack of fire drawings for typical single template development with adult A.A. wards on 1st floor.

3.33 Phased developments on existing hospital sites have generated a need for a minimum building content of a single template at ground and first floor levels because of

a) Site constraints.

b) Decanting.

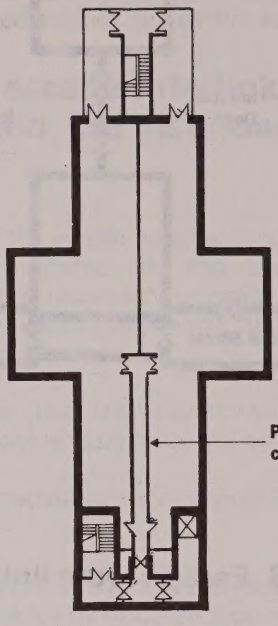
c) Cash limits.

3.34 To meet this need and comply with the minimum requirements specified above the outline design options have been agreed with HOFSI subject to the following:

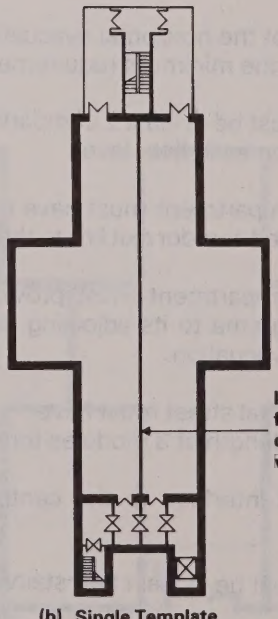
a) Phase is limited to two storey.

b) Ground floor is a life risk compartment.

c) Staffing levels set down in Basic Assumptions para 3.2(d) are maintained.



(a) Single Template with compts. Access via protected corridor



(b) Single Template with 2 compts. each with direct access to street

Fig 25. 1st Floor diagrams showing feasible options for minimum 1st phase development.

Special requirements on location of wards for the elderly in a Nucleus assembly

3.35 The increased evacuation requirements of elderly patients have generated the need for the following additional guidance on the location of these departments.

Wards for the Elderly Type A (Extended Template)

3.36 The desirable location for this department within the DGH in terms of fire precautions priority is as follows:-

a) Ground floor for ease of fire evacuation.

b) Upper floor, intermediate location (between two departments).

c) Upper floor, end location is not recommended. Where it is impossible to achieve a or b above a special agreement with the local fire authority must be reached in the initial planning stages.

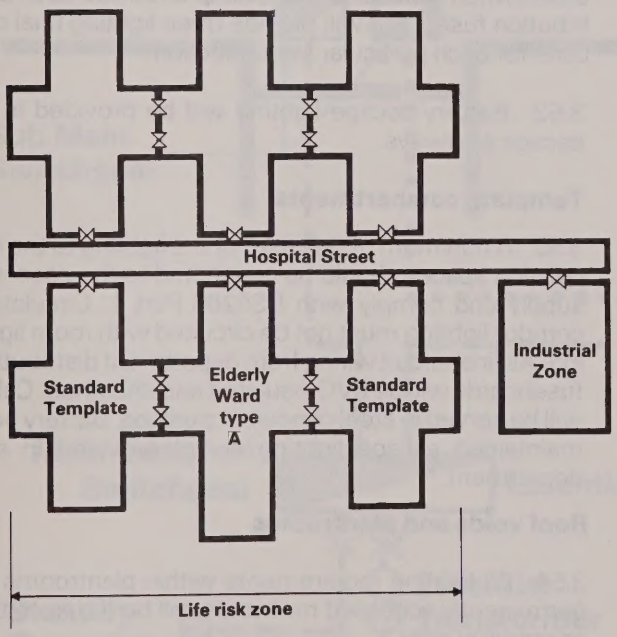
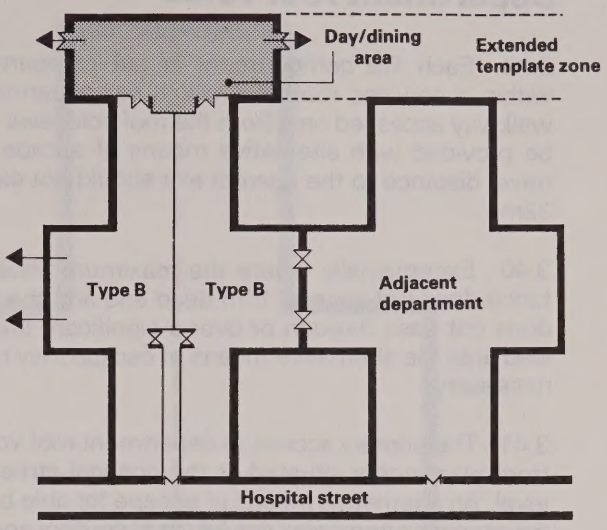


Fig 26. Upper floor plan showing location of wards for the elderly type A

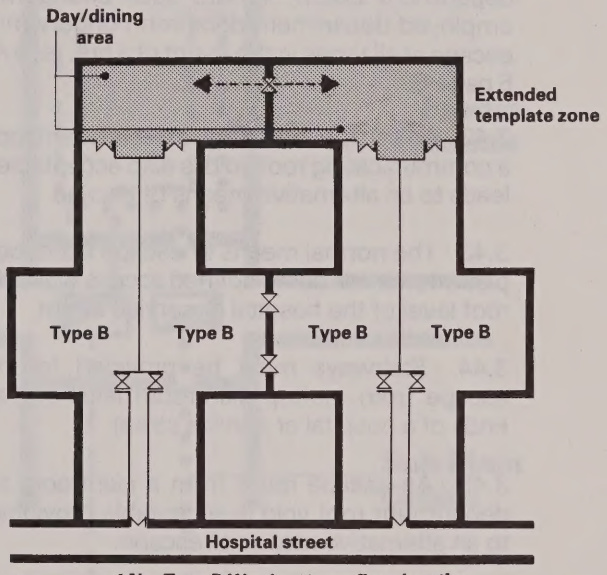
Wards for the Elderly Type B (Extended Template)

3.37 The location of the day/dining area in an extended template zone allows additional means of escape by linking to an adjacent compartment.

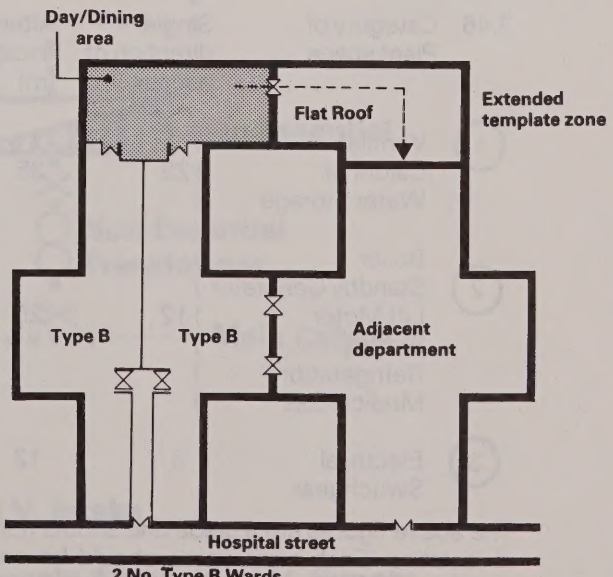
3.38 This arrangement offers several feasible solutions as shown in figure 27. Final details will need to be discussed with the local fire authority.



Case 1 2 No. Type B Wards in one template. Location restricted to ground floor only due to fire exits required from Day/Dining area.



Case 2 4 No. Type B Wards Upper floor location



Case 3 2 No. Type B Wards Upper floor location, with escape over a roof area (see HTM 81 paras 17.56 to 60) from Day/Dining.

Fig 27. Escape requirements from an extended template zone

Department roof voids

3.39 Each fire compartment or sub-compartment within a services roof void which has a permanent walkway accessed only from the roof void level must be provided with alternative means of escape. The travel distance to the nearest exit should not exceed 32m.

3.40 Exceptionally where the maximum travel distance does not exceed 15m dead end and the route does not pass through or over a significant fire risk/ load area the alternative means of escape may not be necessary.

3.41 The primary access to department roof voids is from plantrooms situated at the hospital street roof level. An alternative means of escape for able bodied maintenance personnel can be via a trap door and suitable escape ladder to a place of safety within the department below. Where such arrangements are employed department door ironmongery must allow escape at all times in the event of a fire. (see Appendix 5 page 63).

3.42 An escape route from a department roof void via a communicating roof void is also acceptable where it leads to an alternative means of escape.

3.43 The normal means of escape from roof located plantrooms will be via defined access walkways at the roof level of the hospital or service street.

3.44 Stairways must be provided for means of escape from rooftop plantroom level at the remote ends of a hospital or service street.

3.45 An escape route from a plantroom through a department roof void is acceptable providing it leads to an alternative means of escape.

Travel distances in plant spaces

3.46

	Category of Plant space	Single direction of escape (m)	Alternative escape route (m)
(1)	Ventilation Calorifier Water Storage	) 25	35
(2)	Boiler Standby Generator Lift Motor Battery Refrigeration Medical Gas	) 12	25
(3)	Electrical Switchgear	6	12

The above figures are a guide and should not be used in isolation. Each plant space should be considered individually for means of escape and travel distance in relation to its own risk and that imposed by accommodation above or through which an escape route would pass. Where different categories of plant are combined within a plant space the more onerous requirements must take precedence.

3.47 Fixed vertical ladders to British Standards are acceptable for use as a means of escape by able bodied maintenance personnel in an emergency.

Means of escape - lighting

General

3.48 All lighting will be fed from separately wired, fused and circuited essential and non essential electrical supplies which are connected via transformers for normal working to the electricity authority high voltage supply (See figure 28.)

3.49 Standby generator plant automatically provides a supply to the essential circuits in the event of a supply authority breakdown.

Hospital or service street

3.50 At least two thirds of the hospital or service street lighting which forms the main escape route will be connected to the essential supply.

3.51 All final lighting circuit wiring will be Mineral Insulated Metal Sheathed cable PVC sheathed and fed from local distribution fuseboards located in electrical switch cupboards in the hospital street. Each distribution fuseboard will provide three lighting final circuits for each particular street section.

3.52 Battery escape lighting will be provided in all escape stairways.

Template compartments

3.53 A minimum of one third of the lighting to the circulation spaces should be connected to the essential supply and comply with BS5266 Part 1. Circulation corridor lighting must not be circuited with room lighting. All final circuit wiring from department distribution fuseboards will be PVC insulated and sheathed. Cable will be served in steel conduit or trunking. Battery non-maintained escape lighting is not provided in any department.

Roof voids and plantrooms

3.54 All lighting requirements within plantrooms or permanently accessed roof voids will be fed from the essential supply.

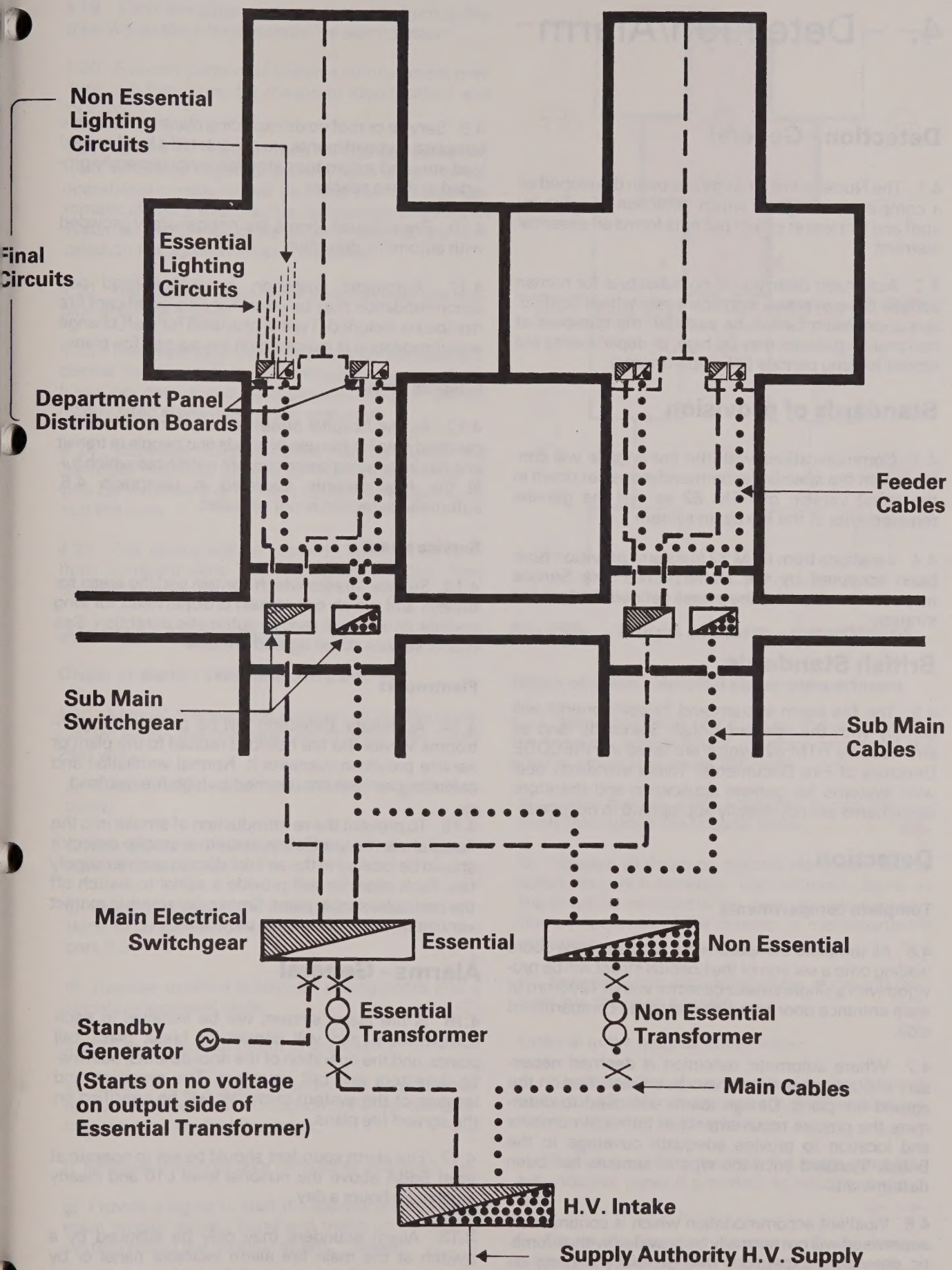


Fig 28. Typical Nucleus electrical distribution

4. Detection/Alarm

Detection - General

4.1 The Nucleus fire strategy has been developed as a complete package in which detection of a fire by staff and to a lesser extent patients forms an essential element.

4.2 Automatic detection is no substitute for human senses but can play a significant role where continuous supervision cannot be assured, the numbers of non mobile patients may be high, or departments are closed for long periods (9-5 departments).

Standards of provision

4.3 Communications with the fire brigade will conform with the specific recommendations set down in the latest version of HTM 82 as will the general requirements of the fire alarm system.

4.4 Variations from HTM 82 fire alarm provision have been accepted by the Home Office Fire Service Inspectorate as part of the overall defined Nucleus fire strategy.

British Standards

4.5 The fire alarm system and its components will comply with the relevant British Standards (and as amended by HTM 82) which are listed in FIRECODE Directory of Fire Documents. These standards deal with systems for general application and therefore some items are not directly appropriate to hospitals.

Detection

Template compartments

4.6 All template compartments with entrance doors leading onto a section of the hospital street will be provided with a single smoke detector within 1200mm of each entrance door set on the template compartment side.

4.7 Where automatic detection is deemed necessary in other areas these have been identified on the agreed fire plans. Design teams will need to determine the precise requirements in terms of numbers and location to provide adequate coverage to the British Standard once the type of sensors has been determined.

4.8 Inpatient accommodation which is continuously supervised will not normally be provided with automatic detection. Exceptions will generally depend on patient type, mobility and general awareness (ie elderly, mentally ill or mentally handicapped). Nucleus fire plans detail the agreed provision.

4.9 Service or roof voids excluding plantrooms above template compartments are considered a low fire risk/load area and automatic detection is not generally provided in these spaces.

4.10 Fire risk/load rooms are not generally provided with automatic detection.

4.11 Automatic detection in unsupervised pod accommodation may be necessary if a significant fire risk/load is included. Typical provision for staff change accommodation is indicated on the agreed fire plans.

Hospital street

4.12 As the hospital street is considered a low fire risk/load area for the use of goods and people in transit and has interfacing compartment entrances which fulfil the requirements specified in paragraph 4.6, automatic detection is not provided.

Service street

4.13 Service streets which contain parking areas for trolleys and which can remain unsupervised for long periods of time will require automatic detection. See typical service street agreed fire plan.

Plantrooms

4.14 Automatic detection will be provided in plantrooms where the fire risk/load related to the plant or service provision warrants it. Normal ventilation and calorifier plant are not deemed as high fire risk/load.

4.15 To prevent the re-introduction of smoke into the hospital via the ventilation system a smoke detector should be located in the air inlet duct to each air supply fan. Each detector will provide a signal to switch off the particular supply plant. Smoke detectors in extract ventilation systems are not provided.

Alarms - General

4.16 A fire alarm system will be installed in each compartment and will consist of break glass call points, and the operation of the door detents, automatic detectors and bell sounders. The provision and location of the system terminals will be specified on the agreed fire plans.

4.17 Fire alarm sounders should be set to operate at least 5dBA above the notional level L10 and clearly audible 24 hours a day.

4.18 Alarm sounders may only be silenced by a switch at the main fire alarm indicator panel or by replacement of the cover of the initiating call point. Silencing of sounders should not prevent the raising of the alarm from another compartment.

4.19 Each template compartment will form a fire zone within the whole hospital fire alarm system.

4.20 Sub-compartments within a compartment may form sub fire zones for means of identification and location.

4.21 Doors in compartment or sub-compartment walls which are required to stand open under normal operational conditions will be fitted with detents (automatic closers) linked to the compartment fire alarm systems. Typical locations of door detents are indicated on the agreed Nucleus fire plans.

4.22 The total alarm system will be fed from the hospital essential supply.

4.23 The main zone indicator panel will be sited in a central location which is continuously manned 24 hours per day - a sub indicator panel may be conveniently sited elsewhere. (main entrance).

4.24 Individual indicator panels may be sited in the particular interface section of the hospital street to provide the means of location of the fire to a particular sub fire zone.

4.25 Call points will be provided adjacent to exits from compartments and sub-compartments. (See standard fire plans.)

Alarms - Operation

Origin of alarm - Template compartment

4.26 Manual or automatic initiation of the fire alarm system within the compartment of origin (see figure 29A) will:-

a) Cause the fire alarm sounders to ring continuously;

b) Release all door detents in compartment and sub-compartment walls;

c) Provide a signal to the mechanical ventilation systems to be switched into a fire situation mode - see para 5.5;

d) Release external automatic sliding doors into a failsafe operational state;

External to the compartment of origin will:-

e) Cause the fire alarm sounders to ring intermittently for 30 seconds throughout all other compartments within the building block;

f) Release additional door detents as indicated;

g) Provide a signal to start the appropriate compartment smoke extract hood and make up air supply system within the hospital street; **Extract** **Supply**

h) Provide a signal to the main fire alarm panel (and sub indicator if provided) to indicate origin of call.

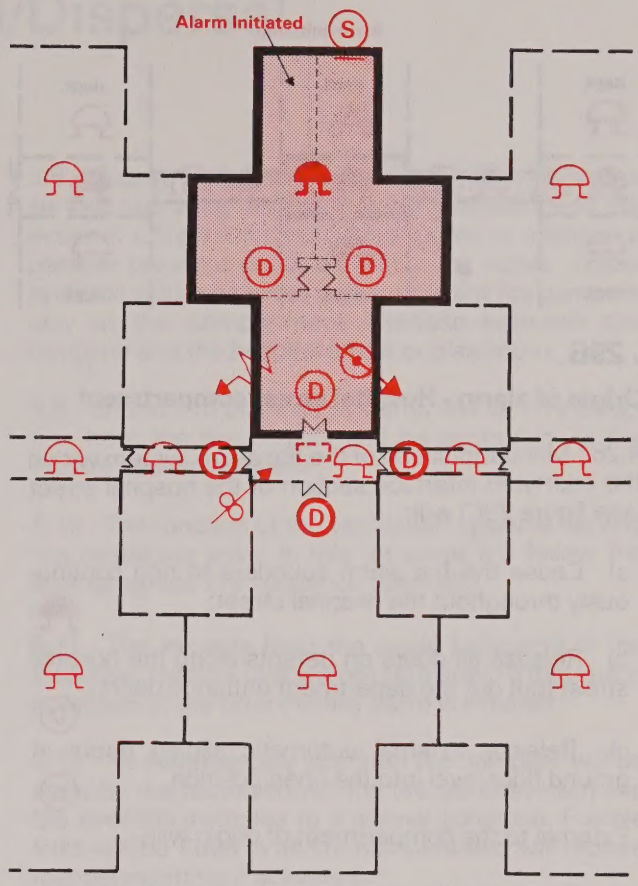


Fig 29A. Origin of alarm - department

Origin of alarm - Hospital street compartment

4.27 Manual initiation of the fire alarm system within the template compartment interface section of the hospital street (see figure 29B) will:-

a) Cause the fire alarm sounders to ring continuously throughout the hospital street;

b) Release all doors on detents along the hospital street (but not template compartment doors as these will be released in the particular interface section by operation of the detector in the department entrance);

c) Release automatic sliding doors at ground floor level into the open position.

External to the hospital street will:-

d) Cause the fire alarm sounders to ring intermittently for 30 seconds throughout all other compartments within the building block;

e) Provide a signal to the main fire alarm panel (and sub indicator panel if provided) to indicate origin of call;

f) Cause the fire alarm sounders to ring continuously in both immediately adjacent departments.

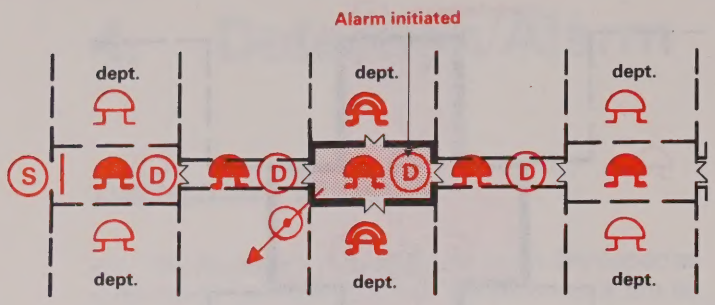


Fig. 29B.

Origin of alarm - Hospital street compartment

4.28 Manual initiation of the fire alarm system within the courtyard interface section of the hospital street (see figure 29C) will:-

a) Cause the fire alarm sounders to ring continuously throughout the hospital street;

b) Release all doors on detents along the hospital street (but not the department entrance doors);

c) Release external automatic sliding doors at ground floor level into the open position.

External to the compartment of origin will:-

d) Cause the fire alarm sounders to ring intermittently for 30 seconds throughout all other compartments within the building block;

e) Provide a signal to the main fire alarm panel (and sub indicator panel if provided) to indicate origin of call.

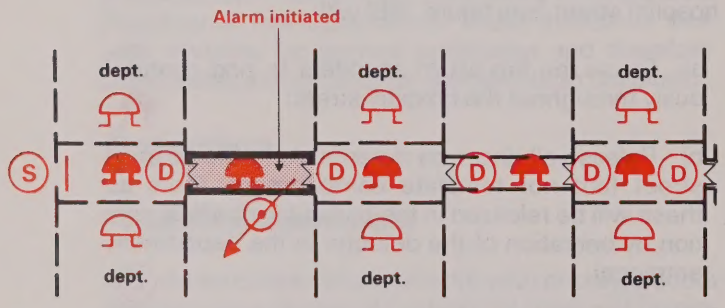


Fig. 29C

Origin of alarm - Pod accommodation

4.29 As pod accommodation forms a sub-compartment of the template compartment to which it is attached, initiation of an alarm within this area will activate the fire alarm system for the whole compartment as stated in paragraph 4.26.

Origin of alarm - Roof voids above template compartments.

4.30 Fire alarm call points will be provided at all final exit points from roof voids accessed directly from roof level and at sub-compartment doors in roof service voids. As the roof void forms part of the particular template fire compartment a call from within this space will activate the fire alarm system for the whole compartment as stated in paragraph 4.26.

4.31 Alarm sounders will be provided within these roof voids if found to be necessary after audibility tests.

Origin of alarm - Plantrooms

4.32 Fire alarm call points will be provided at all exit points from plantrooms and sounders will be provided in all plant spaces. Plantrooms will generally form individual fire compartments.

5. Smoke Ventilation/Dispersal

5.1 The principles of smoke ventilation and dispersal in Nucleus hospitals have been incorporated in two ways.

-that which can be achieved by natural means

-and that by mechanical ventilation systems.

Template compartment

5.2 Most perimeter spaces are naturally lit and ventilated and the inherent alternate courtyard configuration and related building depth provides adequate provision (via windows) for smoke dispersal from these spaces by natural means.

5.3 Generally rooms which have no external elevation (core rooms) are mechanically ventilated. In a fire situation the supply and clean extract air systems are shut off, but the dirty extract systems will continue to operate. Although not specifically designed for smoke venting the operation of the dirty extract system will help to contain the smoke within the core rooms as well as assisting with its dispersal.

5.4 Details of the ventilation systems provision are indicated on the agreed upper level standard fire plan for a range of Nucleus departments. (See Green Pack Vol. 2 Nucleus Fire Plans.)

Control and operation of ventilation systems

5.5 Initiation of the fire alarm system within a template compartment will provide a signal to the automatic fire dampers on supply and clean extract ventilation systems serving that fire compartment to close. The associated ventilation plant will however continue to run. Facilities will be provided in the associated plantroom or hospital street interface for these dampers to be re-instated on the instructions of the fire brigade.

5.6 Where inpatient sleeping accommodation has both supply and extract systems served from common ventilation ducts, only the supply should be switched off in a fire situation. The continual operation of the extract system will help to contain the smoke to within the room of origin and prevent smoke transfer via the inactive supply ductwork in all but extreme cases.

5.7 Dirty extract systems will continue to operate in a fire alarm situation. Isolation of these systems will be on instruction from the fire brigade and will be controlled via the particular plant shut-down. Fusible link controlled fire dampers will be provided at the compartment interface between the template and the hospital street. The siting of fire dampers will be in accordance with figure 30.

5.8 Supply and clean extract ventilation systems serving operating theatre suites will remain on in the event of a fire within this compartment to maintain a positive pressure condition within the suites. These systems will be provided with fusible link fire dampers only at the compartment interface between the template and the hospital street or plantroom.

5.9 Shut-down of these systems will be on instruction from the fire brigade and be controlled via the theatre ventilation plants.

5.10 The function of the ventilation systems serving the remaining areas in this template will follow the normal agreed fire sequence operation.

5.11 The extracts from the single bedrooms in the Intensive Therapy Unit will not shut down if they are in operation at the time the fire alarm is initiated.

5.12 All automatically operated fire dampers will be reset by the restoration of the fire alarm system and the override switches to a normal condition. Fusible links will be fitted in all fire dampers and will require manual resetting if activated.

Hospital street (Template section)

5.13 To assist in retaining a smoke free environment within the hospital street in the event of a fire in a template compartment, a smoke extract system is provided to each set of compartment entrance doors.

5.14 Each template smoke extract system will serve all floor levels on one side of a hospital street section and will operate on activation of the alarm system in any one of the compartments it serves. The system will continue to operate until the particular fire alarm system is reset.

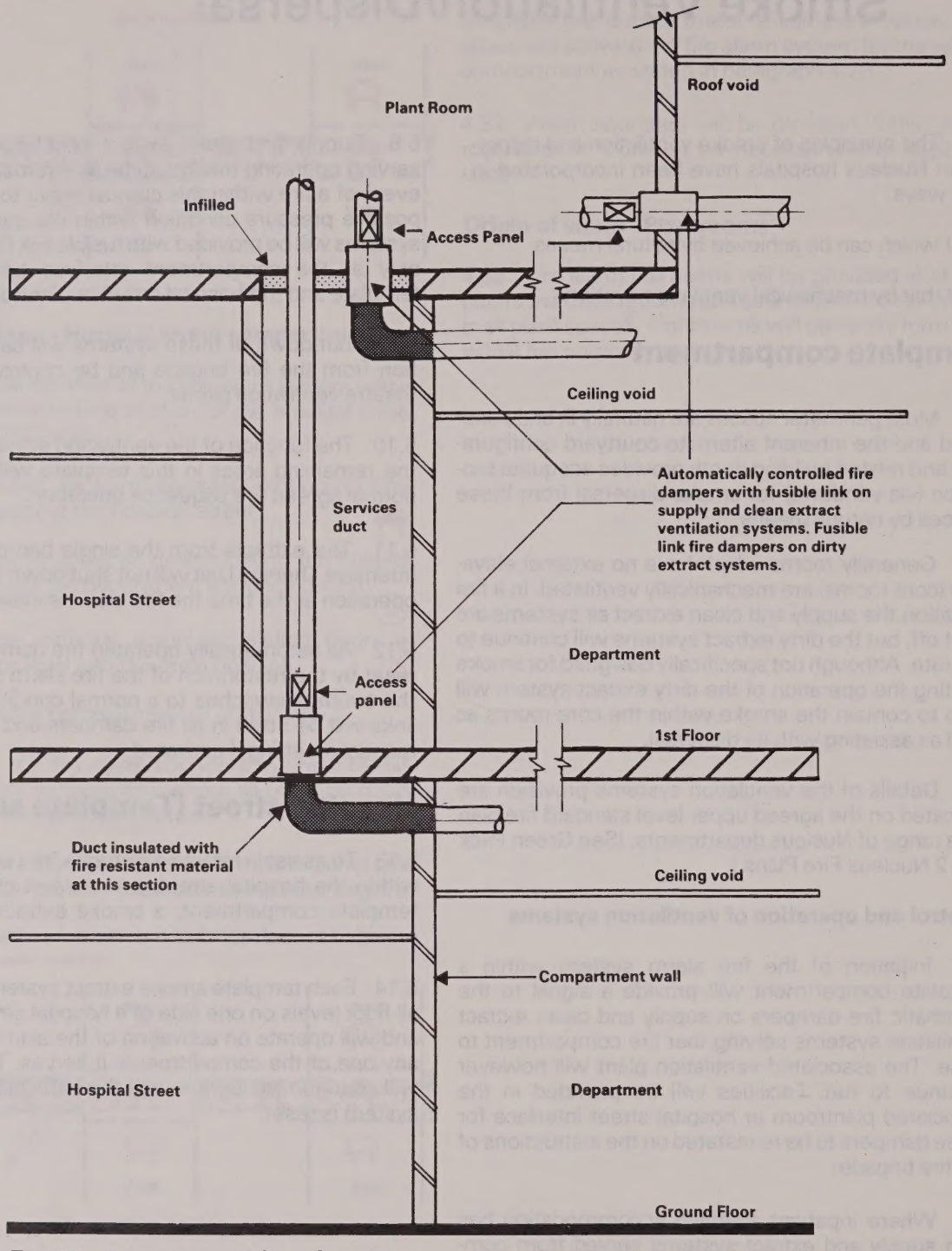


Fig 30. Location of fire dampers

5.15 This system will consist of an extract hood located directly over the compartment entrance doors on the hospital street side and a fan assisted makeup air supply drawn from a diagonally opposite courtyard. See figure 31 and Appendix 6 for design details of the extract hood.

5.16 Hoods will not be provided over doors to the street where the rooms they serve have sealed ceilings and no other access from the template compartment e.g. disposal room.

5.17 Separate ducts from the extract hoods at each floor level will be routed in a separate one hour protected shaft to the roof plantroom. The set of ducts serving one side of the hospital street will be connected together at high level in the plantroom to a single extract fan to discharge above roof level to atmosphere.

5.18 Since noise is not considered to be a significant factor during testing or in a fire situation, the size of the ducts is governed primarily by service duct space limitations and the need for a self balancing installation.

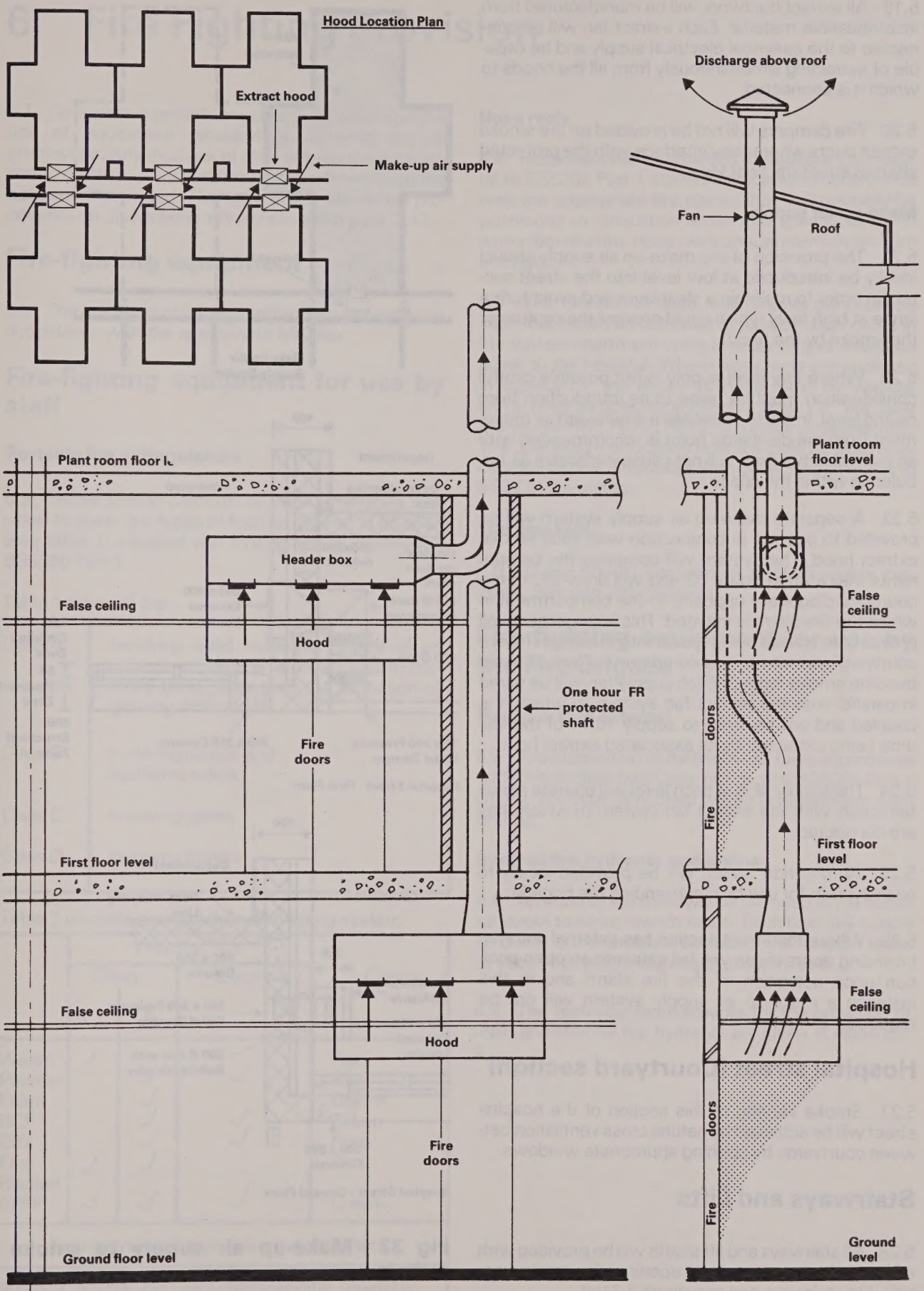


Fig 31. Typical smoke extract hood arrangement

5.19 All extract ductwork will be manufactured from incombustible material. Each extract fan will be connected to the essential electrical supply and be capable of extracting simultaneously from all the hoods to which it is connected.

5.20 Fire dampers will not be provided on the smoke extract ducts where they interface with the protected shaft or structural floor level.

Make-up air supply

5.21 The provision of the make-up air supply should ideally be introduced at low level into the street section in order to maintain a clear layer and avoid turbulence at high level which could prevent the capture of the smoke by the hood.

5.22 Where low level supply is not possible careful consideration must be given to its introduction from ceiling level. In these instances a downward air movement from the discharge point is recommended with an exit velocity which will not cause excessive air turbulence within the space.

5.23 A separate make-up air supply system will be provided to operate in conjunction with each smoke extract hood. The system will comprise the components indicated in figure 32 and will draw air from a courtyard diagonally opposite to the compartment in which the fire alarm is initiated. This arrangement will prevent the smoke being drawn into the street from a courtyard adjacent to the compartment which could become smoke logged. Each supply fan will be wired in parallel with the extract fan system to which it is coupled and will be sized to supply 10/11 of the volume being extracted by its associated extract hood.

5.24 The supply fans at each level will operate simultaneously with the extract fan system to which they are connected.

5.25 An override switch will be provided locally to each system for use by the attending fire brigade.

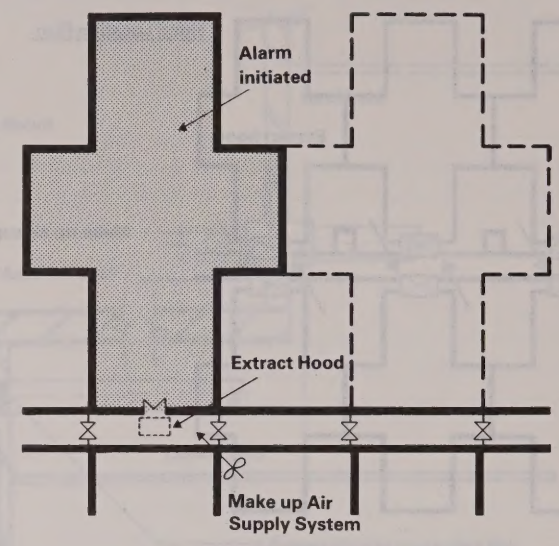
5.26 Where the street section has external automatic sliding doors these will fail safe into an open position upon activation of the fire alarm and in this instance a make-up air supply system will not be required.

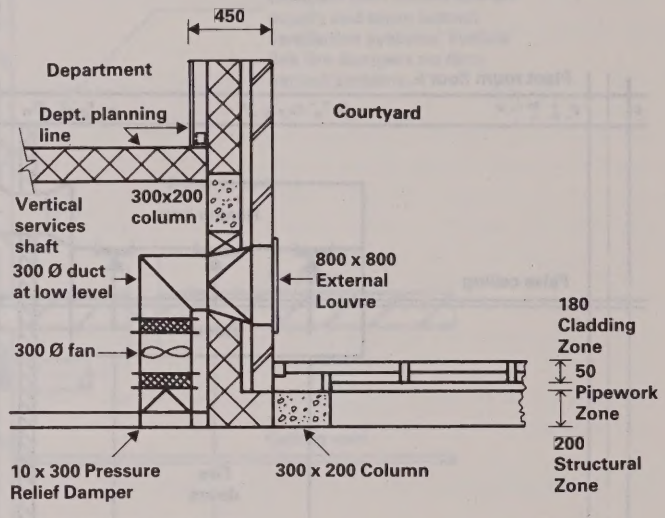
Hospital street (Courtyard section)

5.27 Smoke venting of this section of the hospital street will be achieved by natural cross ventilation between courtyards by opening appropriate windows.

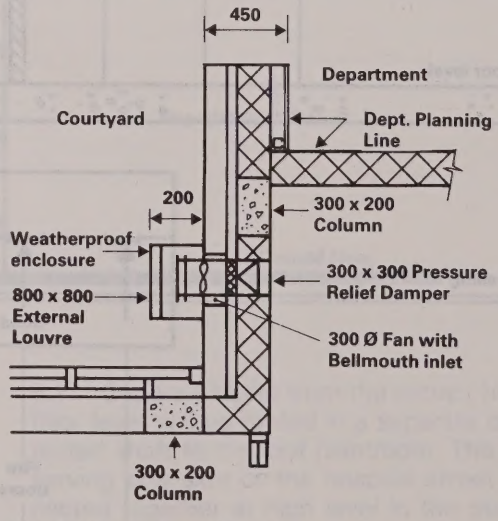
Stairways and Lifts

5.28 All stairways and lift shafts will be provided with adequate high and low level openings for smoke venting. For stairways see paragraph 3.21(c).





Hospital Street - First Floor



Hospital Street - Ground Floor

Fig 32 Make-up air supply to smoke extract

6 Fire Fighting Provision

6.1 Education in general fire safety and training in the use of equipment provided is essential for all employees. Any member of staff may be the first person to discover a fire and should know how to use the equipment provided. The appropriate sequential procedures on discovering a fire are listed in para. 7.17.

Fire-fighting equipment

6.2 The provision of fire-fighting equipment will be in accordance with the appropriate fire plan.

Fire-fighting equipment for use by staff

Portable fire extinguishers

6.3 These should conform to BS5423 and are provided to cover the types of fires as defined in BS4547 (see table 1) installed and maintained as outlined in BS5306 Part 3.

Table 1 types of fire

Class A	Involving solid material, usually of an organic nature in which combustion normally takes place with the formation of glowing embers
Class B	Involving liquids and liquifiable solids
Class C	Involving gases
Class D	Involving metals

Table 2 portable extinguishers and rating system

	Type of Fire			Colour
	Class		Electrical	
	A	B		
Water	✓			Red
Powder		✓	✓	Blue
Foam		✓		Cream
BCF		✓	✓	Green
C02		✓	✓	Black
Fire Blanket	✓	✓		Red
AFFF	✓	✓	✓	Cream
Rating system for portable extinguishers				
A rating system identifies extinguishing capability in relation to the size of a standard test fire. See BS5423.				

Hose reels

6.4 Hose reels will be provided throughout the hospital to BS5306 Part 1 standards located in accordance with the appropriate fire plans. They will normally be positioned in circulation areas and spaced to reach within 6m of a fire. Hose reels should normally be 30m in length.

6.5 The location of hose reels should generally be such that hoses do not need to pass through doors in fire sub-compartment walls in order to give adequate cover to the hospital. Where hose reels are enclosed in cupboards, the doors to these must be without locks, have an opening angle of at least 170° and bear the works FIRE HOSE REEL in conspicuous lettering. The operating instructions notice should be fixed adjacent to the reel. The installation of each hose reel is to BS5274 standards.

Fire blankets

6.6 These should conform to BS6575 where provided. See also DH guidance

Fire fighting equipment for use by the Fire Brigade

Fire hydrants external

6.7 The disposition of hydrants will be in accordance with British Standard Code of Practice BS5306 Part 1 (1976). The type of hydrant will be in accordance with BS750.

Internal fire hydrants and mains

6.8 An internal fire main will be provided in the hospital street to serve branch risers. Each riser will supply an outlet in the template section of the hospital street at each floor level including plantroom level.

6.9 The technical requirements for the provision of main and internal fire hydrants are given at Appendix 7.

Sprinkler installations

6.10 In some Nucleus developments, sprinkler installations may be necessary in high fire risk or high fire load areas, such as main supplies and disposal areas and stores where a fire would:

a) cause a serious threat to a high life risk area;

b) occur in an area which is unsupervised for long periods;

c) be difficult to attack because of its location within the hospital.

6.11 Where sprinklers are used, generally no other form of fire detector will be required and they should be installed in accordance with the Fire Officers Committee Rules and BS5306 Part 2 (1976).

Foam inlets

6.12 The provision of foam inlets if required will be in accordance with BS5306 Part 1 (1976).

Fuel isolation

6.13 Boiler houses containing oil fired boilers will have a fusible link arrangement which, when operated, will cause the fire valve to shut off the oil supply to the burners, close down the pumps to the daily oil service tank, operate the dumping valve and activate the hospital fire alarm system. The installation must ensure that the daily service tanks cannot be supplied by gravity in a fire situation.

6.14 Boiler houses containing gas fired boilers will have a fusible link arrangement which, when operated, will shut off the gas supply to the boiler house and activate the hospital fire alarm system.

6.15 In boiler houses containing dual fuel boiler plant (gas/oil) the fusible link wire arrangement will shut off both services as mentioned above and activate the hospital fire alarm sytem.

6.16 The installation shall comply with BS5410 Part 2 (1978).

6.17 Where fuel tanks are internal to the building they will accord with BS799 Part 5 Oil storage tanks.

Fire Brigade access to site and hospital building

6.18 The project team will need to make an early approach to the local fire authority to agree access into and within the site and into and within the hospital and discuss water supplies, fixed fire extinguishing equipment, wet and dry risers (if required) and other matters concerning the fire-fighting services.

6.19 The external and internal fire-fighting provisions, which should be agreed locally between project team and the local fire authority, are as follows;-

a) External

(i) Access to site.

(ii) Access around building, including special areas.

(iii) Access to external hydrant system.

(iv) Access to supply inlet box of internal firemain.

(v) Access to building.

b) Internal

(i) Number of and access to Fire Zone main and repeater indicator panels.

(ii) Access from street to departments/courtyards.

(iii) Access from stairways/ramps to upper level departments/plant rooms.

(iv) Access to internal firemain hydrant points.

(v) Access for isolation of engineering services including lifts, smoke vent systems, medical gases, etc.

(vi) Access to roof voids.

See figure 33.

For further details of building access see HTM81 Appendix 5.

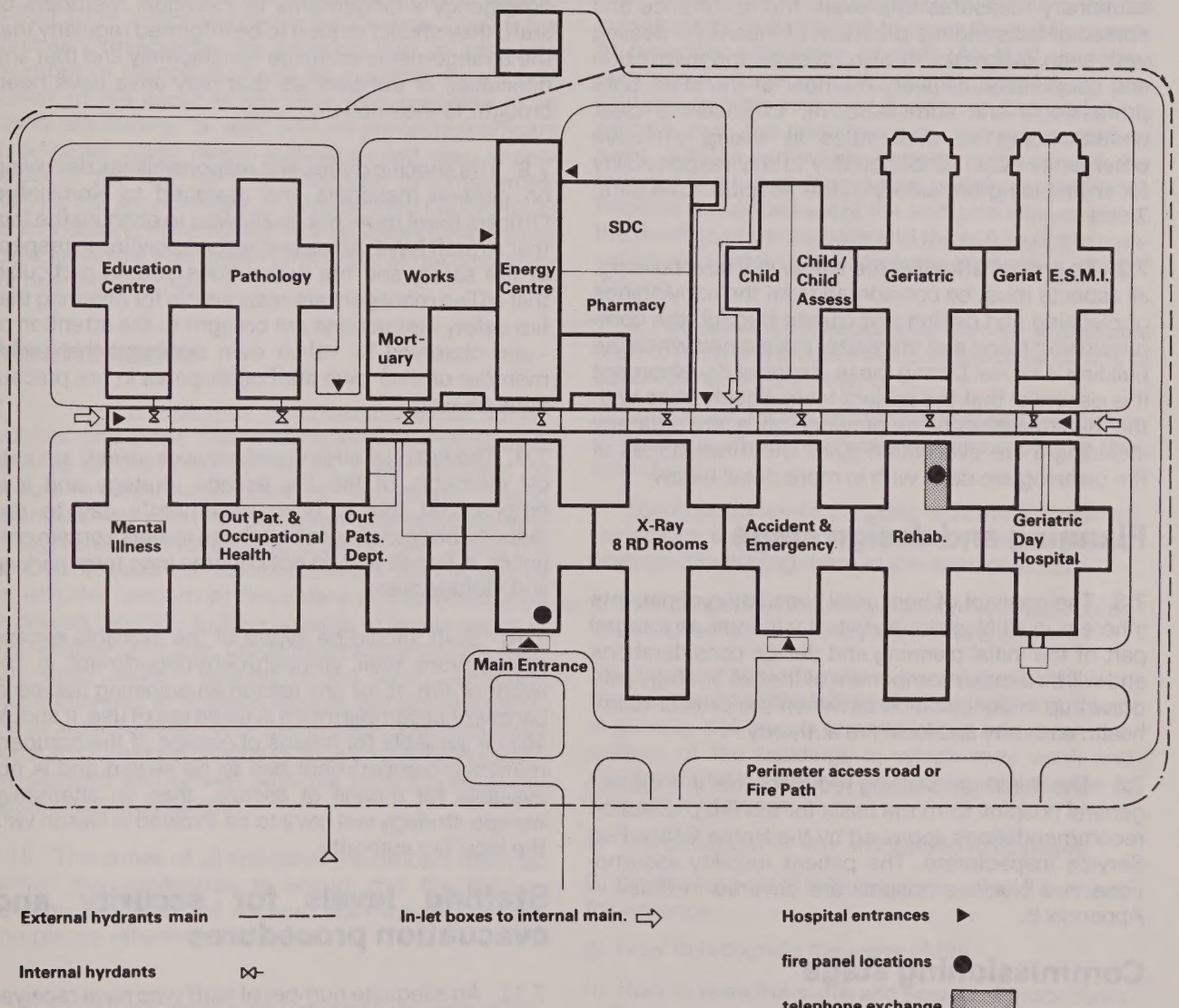


Fig 33. Nucleus Design Example 2

Showing fire fighting provision

7 Management

Introduction

7.1 The role of management in ensuring the drawing up and implementation of composite fire safety plans cannot be stressed too highly. Health authorities are required to have a clearly defined fire precautions policy for all premises under their control. This necessitates a carefully prepared programme for dealing with fire prevention, fire fighting and the movement or evacuation of patients in an emergency. The programme involves the implementation of physical precautionary measures to prevent the occurrence and spread of fires and the provision of means for dealing with such outbreaks. It also involves the instruction and cooperation of every member of the staff, both professional and administrative, to ensure a clear understanding of their roles in taking effective emergency action and their day to day responsibility for maintaining fire safety in the hospital. (See para. 7.16.)

7.2 To ensure effective fire safety in a new building, all aspects must be considered from the early stages of planning and design and carried through the commissioning stage and thereafter maintained when the building is in use. During these stages of development it is essential that the project team closely liaise with the health authority in drawing up a fire strategy including a fire evacuation plan. The three stages of fire planning are dealt with in more detail below:

Planning and design stage

7.3 The concept of horizontal evacuation of patients inherent in all Nucleus hospitals will form an integral part of the initial planning and design considerations and will be a major component of the fire strategy plan drawn up in consultation between the project team, health authority and local fire authority.

7.4 The minimum staffing requirements in a district general hospital form the basis for the fire precaution recommendations approved by the Home Office Fire Service Inspectorate. The patient mobility assumptions in a Nucleus hospital are covered in detail in Appendix 8.

Commissioning stage

7.5 It is important to ensure that during this stage staff training in fire safety and fire evacuation exercises is carried out.

7.6 Further details for evacuation strategy at planning and commissioning stages are contained in the Nucleus document "Fire Evacuation Strategy".

Aspects of maintaining fire safety when buildings are in use

7.7 Responsibility for maintaining comprehensive fire precaution policies and plans when hospitals are in operation rests principally with general managers at each appropriate level. They will be assisted by specialist fire officers appointed in accordance with the instructions in FIRECODE 'Policy and Principles' Chapter 3 Paras 3.5 - 3.11. Whilst senior staff will naturally delegate particular duties within the overall emergency arrangements to individual members of staff, they should require to be informed regularly that the arrangements continue satisfactorily and that any difficulties or deficiencies that may arise have been brought to their notice.

7.8 The specific duties and responsibilities devolving on general managers and assigned to Nominated Officers (Fire) must not be allowed to obscure the fact that all staff have duties and responsibilities in respect of fire safety and fire precautions and, in particular, that all line managers are responsible for ensuring that fire safety instructions are brought to the attention of - and observed by - their own staff and that every member of their own staff participates in fire precautions training.

7.9 The hospital street (and services street) are critical elements of the fire escape strategy and it is emphasised that it is management's day to day responsibility to ensure that these streets contain only goods in transit and do not become long term parking and storage areas.

7.10 Staff should be aware of the available escape routes from their compartment/department in the event of fire. If for any reason an adjoining sub-compartment or compartment is taken out of use, it should still be available for means of escape. If the compartment/sub-compartment has to be sealed and is not available for means of escape, then an alternative escape strategy will have to be evolved in liaison with the local fire authority.

Staffing levels for security and evacuation procedures

7.11 An adequate number of staff who have received effective training in fire precautions is the best first-line defence against fire. This is particularly important at night when levels of activity in a hospital are reduced and detection of an outbreak of fire is more likely to be delayed. The presence of trained staff who can respond promptly and effectively to any fire emergency is a vital factor in limiting the consequences of an outbreak, particularly where dependent patients are involved.

7.12 Staffing levels will be related to clinical and other operational needs and will therefore vary considerably at different periods of time. However, the medical and nursing needs of patients in a district general hospital are deemed to require that a minimum of 2 nurses are on duty for each 28 bed acute nursing section at all times. The fire precaution recommendations agreed with the Home Office Fire Service Inspectorate are based on the assumption that that requirement will be met. In the event of fire it is to be expected that additional staff will be mobilised to assist in the fire area as determined by local policy. Unless other specific arrangements have been made, the senior nurse in a section should be responsible for taking the initiative until relieved.

7.13 The Nominated Officer (Fire) appointed in all hospital premises in accordance with instructions in FIRECODE 'Policy and Principles' Chapter 3 para 3.5 is primarily responsible for ensuring that an adequate number of trained staff will be available should outbreak of fire occur at any time. The provision of an adequate number of specialist fire precaution officers is a matter which health authorities will need to consider in the light of their particular circumstances. Whilst the appointment of a Nominated Officer (Fire) is mandatory, the provision of Fire Safety Officers and Specialist Fire Prevention Officers is at the discretion of health authorities.

Maintenance

7.14 The instituting of comprehensive fire safety policies and plans and the implementation of staff training programmes is not of itself sufficient to ensure a reasonable level of fire safety. These arrangements must not be treated statically, allowing a degree of complacency to creep in particularly if a serious fire outbreak has not occurred. The essence of an efficient system of fire safety is that it must be reviewed regularly to take account of any changes in the hospital structure, procedures and any other matters which have a bearing on fire safety. Although major changes in Nucleus layouts will be infrequent, minor alterations and changes in personnel frequently occur and the likely effects of such changes should be pre-planned and agreed with the local fire authority before implementation.

7.15 The duties of all specialist fire officers must be carried out assiduously to ensure that fire fighting equipment, means of escape, staff training etc are completely effective at all times.

7.16 Health authorities are required to provide effective training in fire prevention and in how to respond to a fire outbreak for all their staff without exception ie medical, nursing, technical, domestic and administrative. This requirement is considered of vital importance and it is the duty of managers of all disciplines to ensure that all staff have both basic instruction in fire precautions and training appropriate to their own particular category and specific needs. It is essential that every member of staff in the NHS; (a) understands the character of fire, smoke and toxic fumes, (b) knows the fire hazards involved in the working environment, (c) practises and promotes fire prevention, and (d) knows instinctively the right action to take if fire breaks out.

7.17 Because fire and smoke can develop so rapidly and cause confusion and fear, training should emphasise the need for a speedy and disciplined response if an outbreak is discovered. Basic fire precautions should be included in "induction" training for new staff so that they may understand the sequence of action required in the event of a fire:-

Raise the alarm
Remove patients in immediate danger
Fight the fire if it is safe to do so
Evacuate the area
Close all doors.

7.18 Further training should be provided to cover the subject in more depth and to meet the special needs of particular categories of staff. All staff, including part-time and agency staff, should attend a fire precautions training course at least once, but preferably twice, a year. The need to provide training for staff on night duty is particularly important in view of the reduced level of staffing which pertains at that time. Records should be kept of the staff attending courses, the duration of the courses and the nature of the training given in order to identify those staff still in need of training.

7.19 Effective fire precautions training will enable staff to learn and practise not only the basic course of action but also the following:-

a) The reason for fire and smoke compartmentation of buildings and for protected escape routes to the open air.

b) The importance of ensuring that the function of fire/smoke doors is not defeated by the dangerous practice of wedging them in the open position.

c) The dangers of allowing doors on escape routes to be locked without ready access to a key.

d) The need to be familiar with escape routes (and the need to keep them free of obstruction e.g. items in transit), site layout, internal layout and communications of the buildings in which they work and reside so that if a fire breaks out they can escape or help others to escape.

e) The behaviour of fire, smoke and toxic gases.

f) The fire hazards of their environment and the need for vigilance.

g) How to recognise the signs of fire.

h) How to raise the alarm and how local procedures for dealing with a fire operate.

i) In general, when and how to tackle a fire, which fire appliance to use, how to operate it and, equally important, when to leave fire fighting to the fire brigade.

j) The circumstances under which patients should be removed to a place of safety and how evacuation should be carried out.

List of Appendices

1. Project application procedure

2. Nucleus standard fire information

Nucleus standard fire drawings

Projects with standard and non-standard departments

Exemplar fire plans - adult acute ward

Nucleus fire plan symbols

Schedule of standard Nucleus fire plans

3. Risk categories of hospital departments

4. Construction standards

5. Extracts from Project Information Bulletins

6. Department interface - smoke extract hood design data

7. Internal fire hydrants and mains

8. Fire evacuation/staffing requirements

Appendix 1 Project Application Procedure

The Application of Nucleus Fire Precautions Recommendations (NFPR)

A1.1 The feedback from a number of Nucleus projects suggests that it would be helpful to include guidance in this document on ways of achieving continuing endorsement by the local fire authority of the fire safety standards proposed for a new hospital, throughout the various stages from planning to bringing into use.

A1.2 This Appendix

a) Sets out a procedure for achieving approval of the fire precautions in a Nucleus hospital;

b) Outlines the responsibilities of the DH and the NHS, including that of general management, for fire precautions and fire safety; also the liaison arrangements with the local fire authority.

A1.3 A central agreement has been reached with the Home Office Fire Service Inspectorate to cover the general principles of means of escape and related fire precautions requirements of:

a) The Nucleus hospital design examples; see figures 1 and 2 on pages 3 and 4.

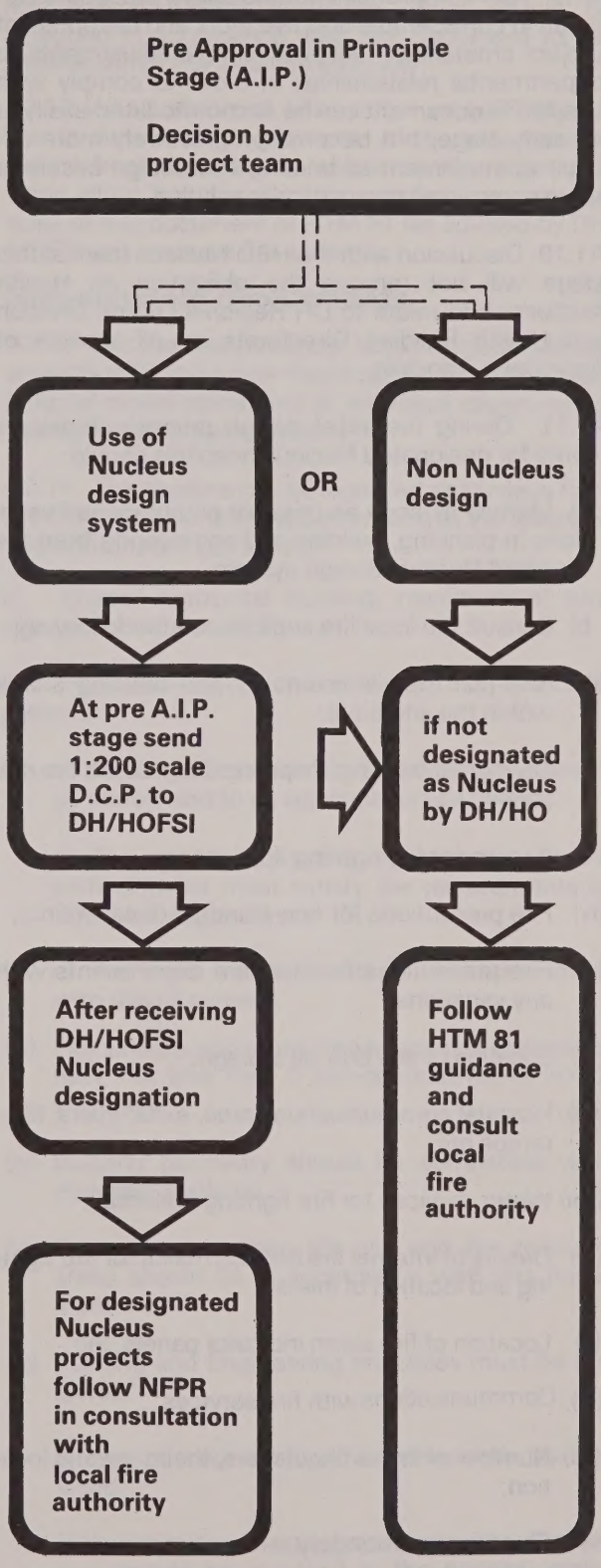
b) The fire plans of the range of standard Nucleus departments so far produced.

A1.4 The agreement reached with the Home Office Fire Service Inspectorate, and as set out in this booklet and green pack of standard department fire drawings, relates to a specific configuration and design. Early consultations on Nucleus or non-Nucleus designation with DH and HOFSI are advised.

A1.5 Before approaching the local fire authority, confirmation that the project can be designated Nucleus should be obtained from the DH Health Building Directorate.

A1.6 A majority of the projects vary the standard model Development Control Plan (DCP) configuration (see figures 1 and 2) to suit their specific project requirements and also contain a mixture of standard and non standard departments. Therefore the project application of NFPR is subject to the DH HBD/HOFSI agreement to each project-specific DCP.

A1.7 The following flow diagram indicates the sequential agreement procedure.


Pre Approval in Principle Stage (A.I.P.)
Decision by project team
Use of Nucleus design system
OR
Non Nucleus design
At pre A.I.P. stage send 1:200 scale D.C.P. to DH/HOFSI
if not designated as Nucleus by DH/HO
After receiving DH/HOFSI Nucleus designation
Follow HTM 81 guidance and consult local fire authority
For designated Nucleus projects follow NFPR in consultation with local fire authority

A1.8 When possible, conformity with the Nucleus Fire Precautions principles should be confirmed when a scheme description is being prepared as part of an Approval in Principle (AIP) submission (see CAPRICODE annex 1 C paragraph 4).

A1.9 Non-compliance with the above procedure can result in considerable abortive work and disruption of project timetables. Relatively simple adjustments to departmental relationships in order to comply with this NFPR document can be accommodated easily at an early stage, but become progressively more difficult to implement as briefing and design becomes more committed to a particular solution.

A1.10 Discussion with the HBD Nucleus team at this stage will not remove the obligation on Health Authorities to relate to DH Regional Liaison Division and Health Building Directorate on all aspects of Approval in Principle.

A1.11 During the initial design process all design teams for designated Nucleus hospitals should:

a) Identify as soon as possible any proposed variations in planning, building and engineering from the standard Nucleus design system.

b) Consult the local fire authority on the following;

(i) Site plan details (contours and building shape within the site area);

(ii) Division of building shape into life risk and fire risk zones;

(iii) Access for fire fighting appliances;

(iv) Fire precautions for non-standard departments;

(v) Fire precautions for standard departments with any variations;

(vi) Location of any bulk oil storage;

(vii) Hospital communications area, exits, stairs, lifts, ramps etc;

(viii) Water services for fire fighting (external);

(ix) Details of internal fire brigade mains for fire fighting and location of inlets;

(x) Location of fire alarm indicator panels, etc;

(xi) Communications with fire services;

(xii) Number of fire extinguishers, their type and location;

(xiii) Fire door ironmongery.

Other aspects as listed in HTM 81 paragraph 23.5-7.

A1.12 If during later stages of design or during construction or post contract, changes are proposed which might affect previous fire precaution agreements reached, there should be further consultation with the local fire authority before implementation.

Responsibilities for guidance and application

A1.13 In the main it is DH Health Building Directorate which is responsible for providing fire precautions guidance on hospital design.

A1.14 At present, projects which DH and the Home Office Fire Service Inspectorate have agreed can be termed "Nucleus", should follow the Nucleus Fire Precautions Recommendations. All other projects should comply with HTM 81.

A1.15 Regional or District Health Authorities (according to the size of the project or regional arrangements of delegation) are responsible for: the application of DH fire precautions guidance to a project; for compliance with statutory requirements; for the design of the buildings, the specifications adopted, constructional standards, site inspections; and the completion and handover of buildings to the users. During these various stages in the development of a project, Design Teams should liaise directly with the local fire authority.

A1.16 The design team will be responsible for producing the project specific fire precautions strategy ensuring compliance with all statutory legislation as well as fire planning advice from the local fire authority and handing over to the health authority.

A1.17 Once the hospital buildings have been commissioned by the District Health Authority and are in operation, it will normally be the District Nominated Fire Officer who will liaise with the local fire authority as he does with any other operational hospital. The overall responsibility for any action will, however,rest with the District General Manager. (See Section 3 of FIRECODE - Policy and Principles).

Appendix 2 Nucleus Standard Fire Information

Nucleus standard fire drawings

A2.1 1:50 scale fire drawings for hospital departments have been agreed with Home Office Fire Service Inspectorate.

A2.2 The fire drawings are based on the design principles stated in this guidance document which should be read in conjunction with the drawings.

A2.3 The fire drawings represent an acceptable standard of fire precautions provision which will comply with fire certification standards if designated under the Fire Precautions Act 1971.

A2.4 It is emphasised that any variations from the standard Nucleus operational policies, staffing levels, staff fire training, building and engineering strategy etc, may necessitate reappraisal of the project fire drawings. (See Appendix 1).

Scope and limitations

A2.5 The use of these fire plans is limited to Nucleus hospitals only.

A2.6 The individual departmental fire plans are a part of the Nucleus hospital design examples 1 and 2 (see figures 1 and 2) and should not be interpreted in isolation.

Green packs of fire drawings volumes 1 and 2 (see pages 53 and 54 for schedule of fire plans).

A2.7 The agreed fire drawings are published separately in two volumes.

A2.8 Volume 1 contains fire plans agreed up to 1980. In this volume all the fire precautions information including ceiling void requirements is shown on one drawing.

A2.9 Volume 2 contains fire plans agreed since 1980. In this volume fire precautions information is contained in two fire drawings for each department. One fire plan provides information up to suspended ceiling level and the other gives relevant details for the ceiling void.

See following pages for two fire plans for the Adult Acute Ward and Nucleus fire plan symbols.

Fire doors ironmongery and portable extinguishers

A2.10 The standard fire plans only contain the generic requirements of these items. However as these are critical to the evacuation strategy, the project specific hardware should be agreed with the local fire authority.

Projects with standard and non-standard departments

A2.11 Most projects include a blend of standard Nucleus templates, adaptations to standard templates and one-off design templates which should be designed in accordance with this document to the satisfaction of the local fire authority.

A2.12 When abnormal site factors or user requirements dictate, some elements of the scheme may depart from the usual template configuration, provided either that they comply with the recommendations of this document or HTM 81 (as advised by DH/HOFSI and the local fire authority.)

Non-standard departments

A2.13 It is realised that most of the Nucleus hospital projects will need some modifications to the standard hospital model plans, and to individual departments, to meet local requirements.

A2.14 The designs can be regarded as Nucleus from the fire precautions viewpoint so long as the following basic criteria are not varied:-

(i) Overall horizontal building, maximum of two storeys above ground floor.

(ii) Horizontal escape movement for non-ambulant patients:

a) All compartments must be linked to the hospital street; and to an adjacent compartment.

b) The provision of sub-compartments within a compartment must satisfy the requirements of Section 2 pages 14 and 15.

c) The travel distances should be in accordance with this document.

(iii) Fire safe escape route - the hospital street should have not less than 3 sub-compartments and 2 stairways.

(iv) Building geometry should be compatible with standard Nucleus.

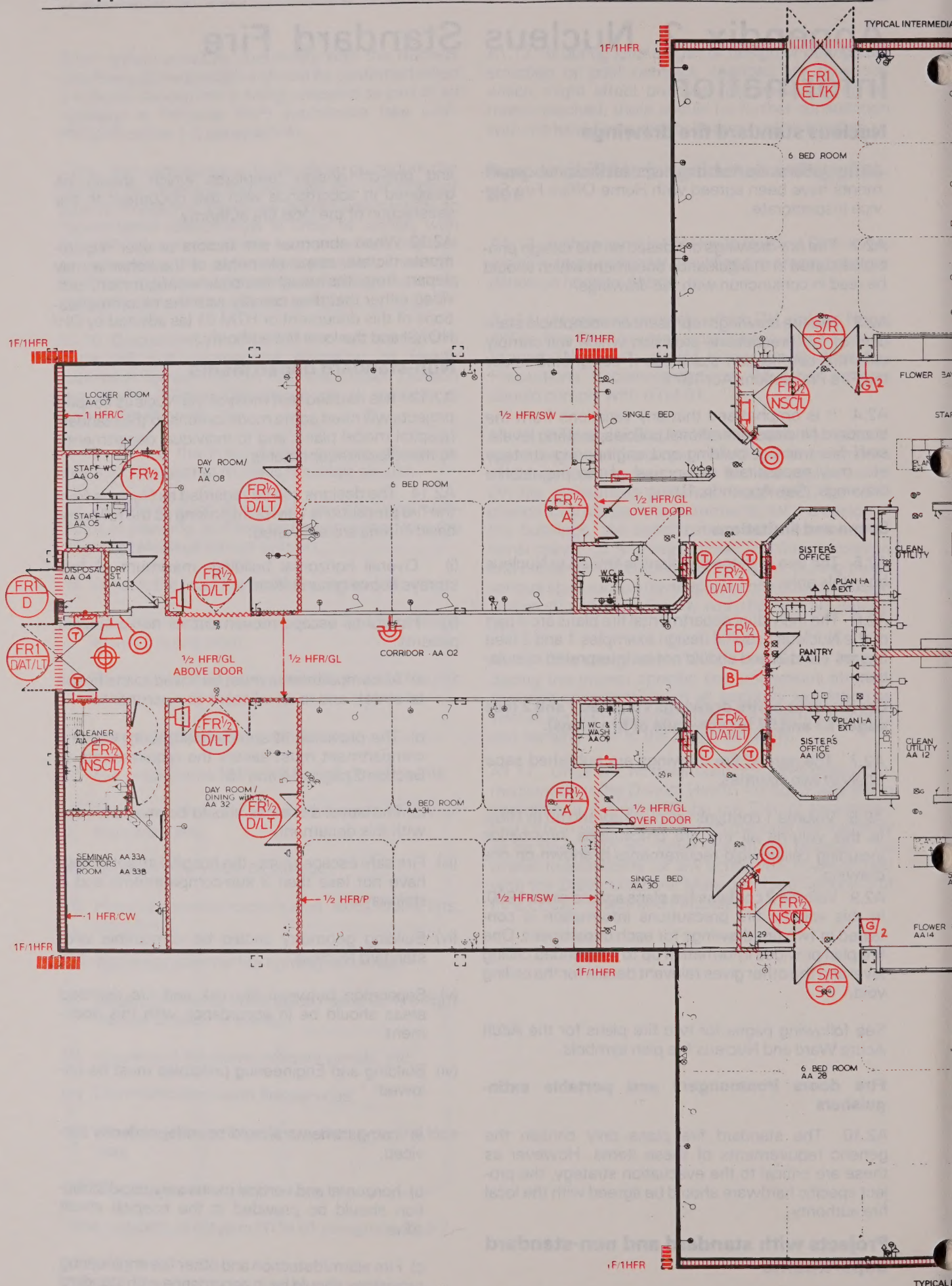
(v) Separation between life risk and fire risk/load areas should be in accordance with this document.

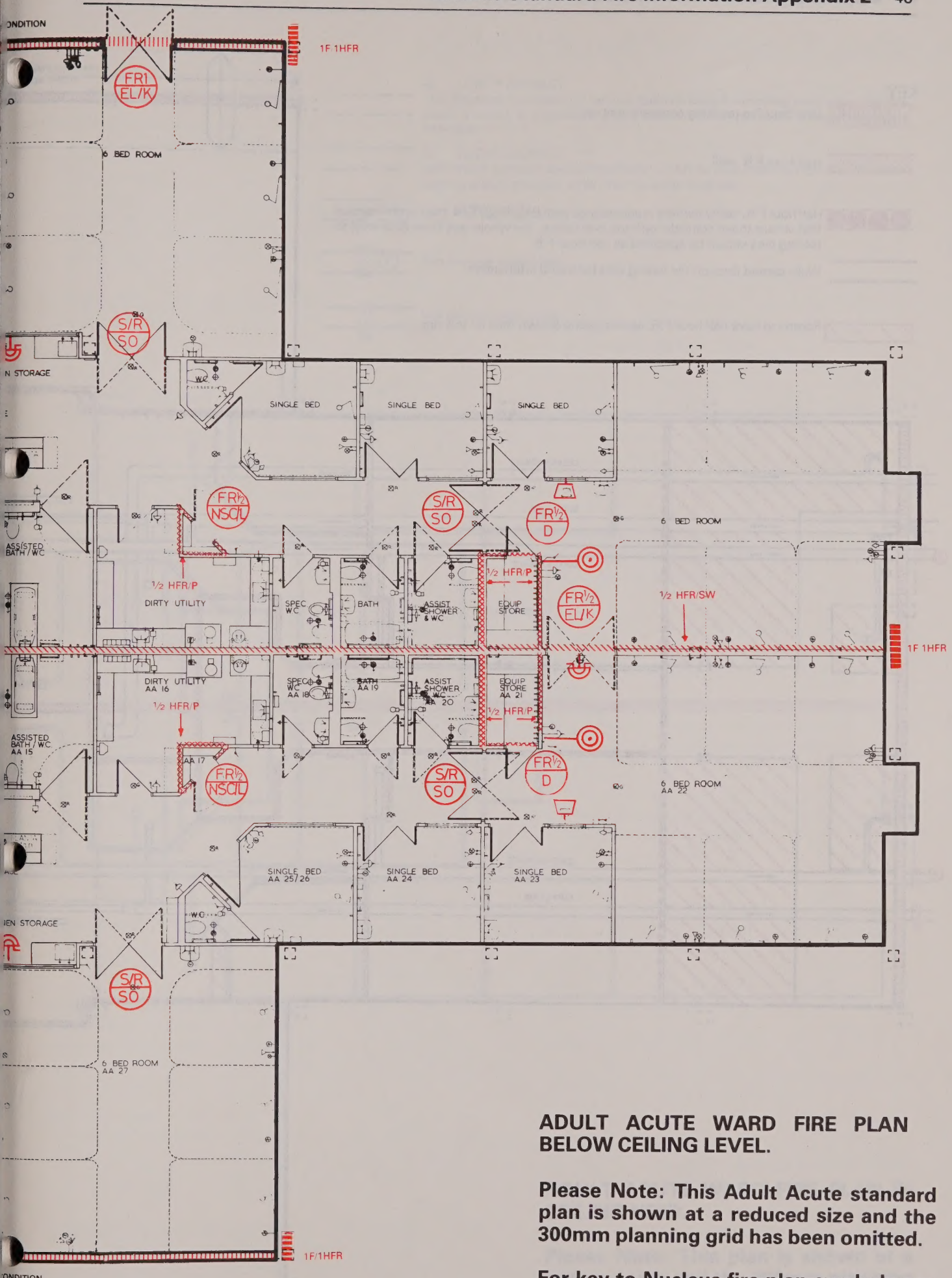
(vi) Building and Engineering principles must be followed:

a) compartments should be independently serviced.

b) horizontal and vertical mains services distribution should be provided in the hospital street zone.

c) Fire alarm/detection and other fire engineering provisions should be in accordance with standard Nucleus engineering brief.


TYPICAL INTERMEDIA
1F/1HFR
FR1 EL/K
6 BED ROOM
S/R SO
FR½ NSC/L
G 2
FLOWER
1F/1HFR
1F/1HFR
LOCKER ROOM AA 07
1 HFR/C
STAFF WC AA 06
FR½
DAY ROOM/ T.V AA 08
FR½ D/LT
STAFF WC AA 05
6 BED ROOM
½ HFR/SW
SINGLE BED
FR½ A
½ HFR/GL OVER DOOR
SISTER'S OFFICE
CLEAN UTILITY
PLAN I-A EXT
DISPOSAL AA 04
DRY ST. AA 03
FR1 D
FR½ D/LT
FR½ D/AT/LT
FR1 D/AT/LT
½ HFR/GL ABOVE DOOR
½ HFR/GL
CORRIDOR AA 02
FR½ D
PANTRY AA 11
B
CLEANER AA 01
FR½ NSC/L
FR½ D/LT
WC & WASH AA 09
FR½ D/AT/LT
PLAN I-A EXT
SISTER'S OFFICE AA 10
CLEAN UTILITY AA 12
DAY ROOM / DINING AA 32
FR½ D/LT
6 BED ROOM AA 31
FR½ A
½ HFR/GL OVER DOOR
SEMINAR AA 33A
DOCTORS ROOM AA 33B
1 HFR/CW
½ HFR/P
½ HFR/SW
SINGLE BED AA 30
FR½ NSC/L
AA 29
G 2
FLOWER AA 14
1F/1HFR
1F/1HFR
S/R SO
6 BED ROOM AA 28
1F/1HFR
TYPICAL



ADULT ACUTE WARD FIRE PLAN BELOW CEILING LEVEL.

Please Note: This Adult Acute standard plan is shown at a reduced size and the 300mm planning grid has been omitted.

For key to Nucleus fire plan symbols see pages 49 to 52.

KEY

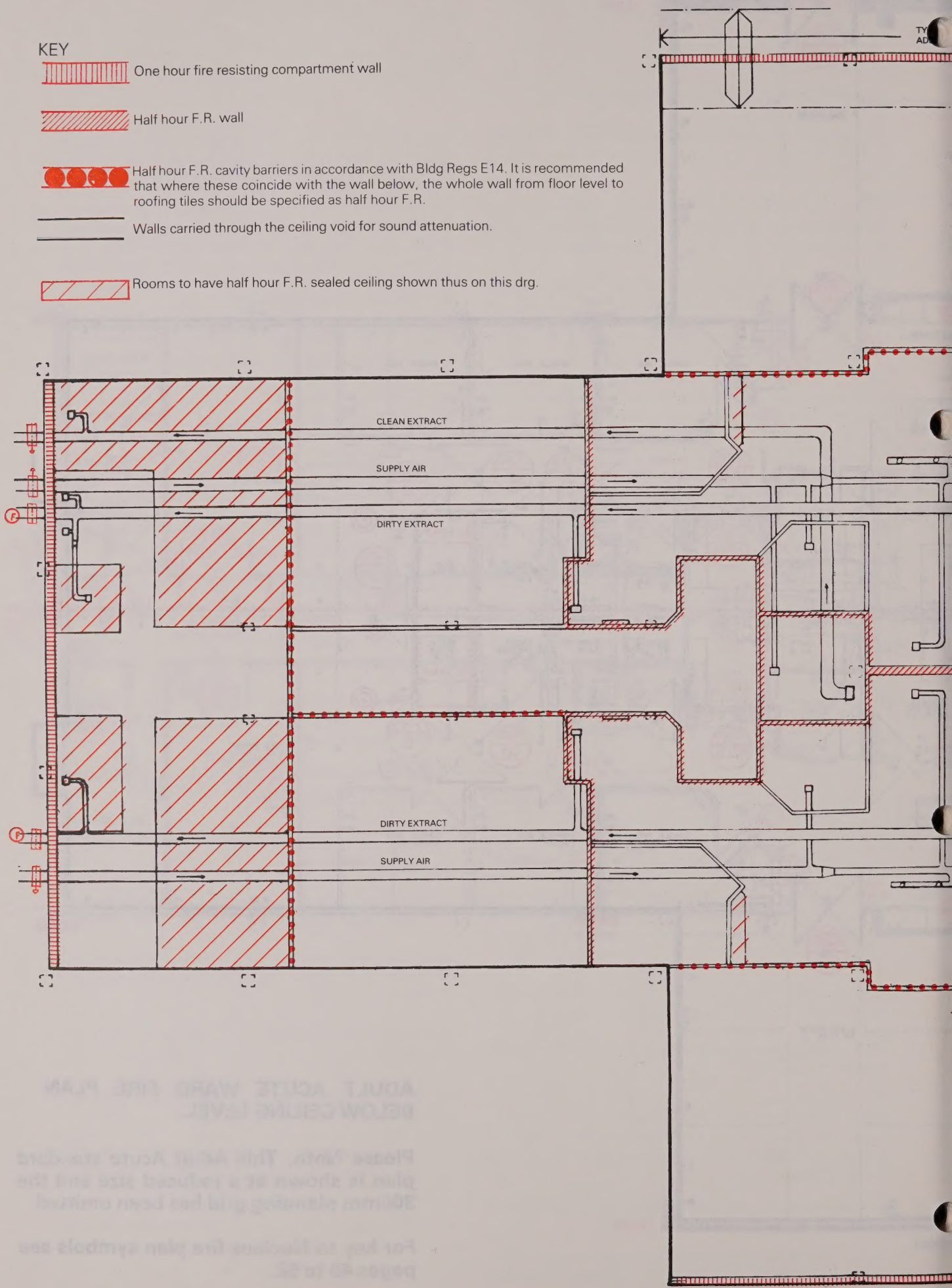
One hour fire resisting compartment wall

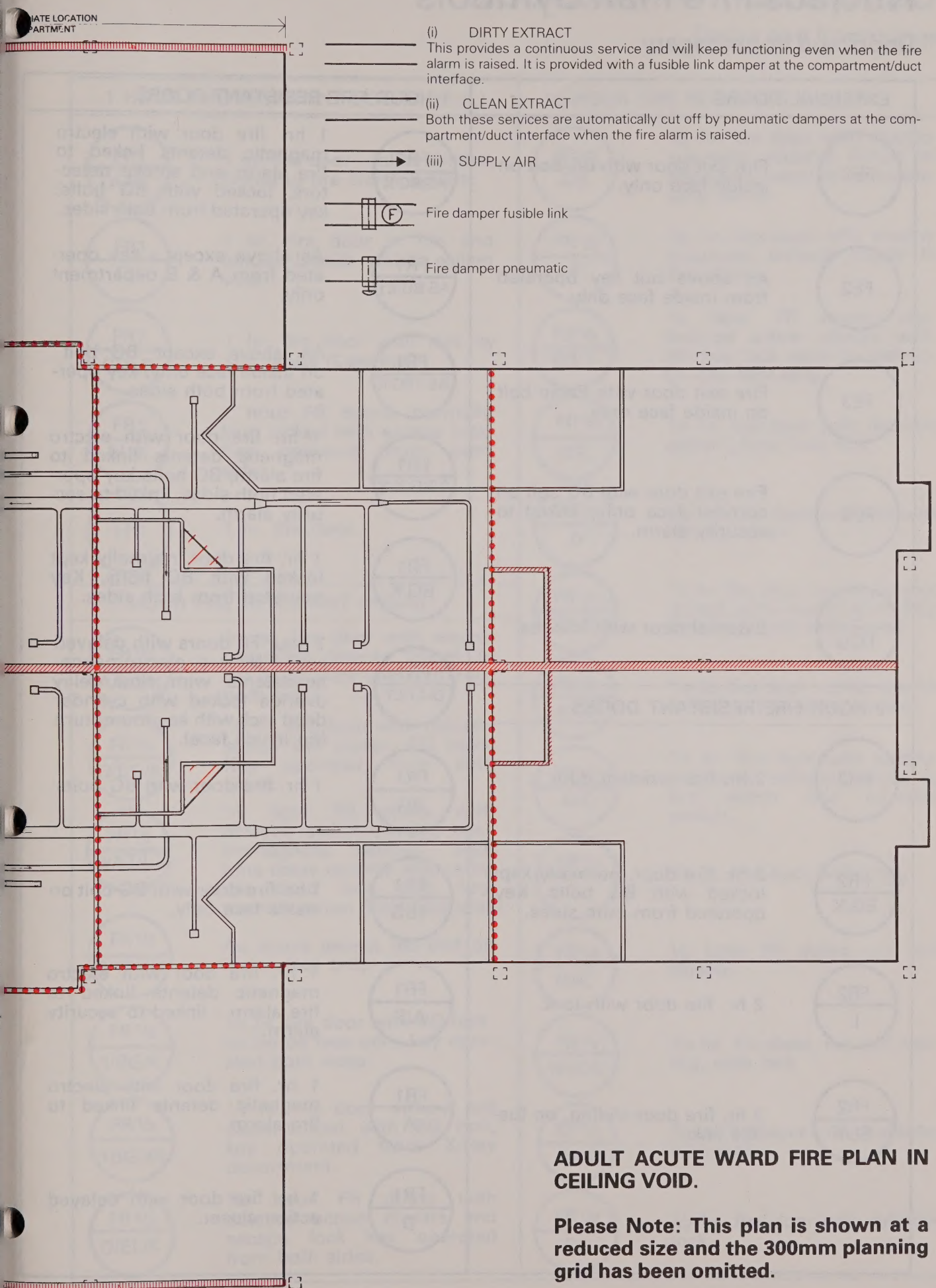
Half hour F.R. wall

Half hour F.R. cavity barriers in accordance with Bldg Regs E14. It is recommended that where these coincide with the wall below, the whole wall from floor level to roofing tiles should be specified as half hour F.R.

Walls carried through the ceiling void for sound attenuation.

Rooms to have half hour F.R. sealed ceiling shown thus on this drg.




IATE LOCATION
PARTMENT
(i) DIRTY EXTRACT
This provides a continuous service and will keep functioning even when the fire alarm is raised. It is provided with a fusible link damper at the compartment/duct interface.
(ii) CLEAN EXTRACT
Both these services are automatically cut off by pneumatic dampers at the compartment/duct interface when the fire alarm is raised.
(iii) SUPPLY AIR
F
Fire damper fusible link
Fire damper pneumatic

ADULT ACUTE WARD FIRE PLAN IN CEILING VOID.

Please Note: This plan is shown at a reduced size and the 300mm planning grid has been omitted.

Nucleus Fire Plan Symbols

Doors and Ironmongery

EXTERNAL DOORS

FE1	Fire exit door with BG bolt on inside face only.
FE2	As above but key operated from inside face only.
FE3	Fire exit door with Panic bolt on inside face only.
FE4	Fire exit door with BG bolt on corridor face only, linked to security alarm.
E / LOU	External door with louvres.

2 HOUR FIRE RESISTANT DOORS

FR2	2 hr. fire resistant door.
FR2 / BG/K	2 hr. fire door, normally kept locked with BG bolts. Key operated from both sides.
FR2 / L	2 hr. fire door with lock.
FR2 / SL/F	2 hr. fire door-sliding, on fusible link.

1 HOUR FIRE RESISTANT DOORS

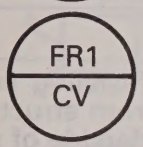
FR1 / AS/BG/K	1 hr. fire door with electro magnetic detents linked to fire alarm and smoke detectors, locked with BG bolts; key operated from both sides.
FR1 / AS/BG/K1	As above except - key operated from A & E department only.
FR1 / AS/1BG/K	As above except BG bolt on inside face only; key operated from both sides.
FR1 / A/BG/K/S	1 hr. fire door with electro magnetic detents linked to fire alarm; BG bolts key operated both sides, linked to security alarm.
FR1 / BG/K	1 hr. fire door, normally kept locked with BG bolts. Key operated from both sides.
FR1 / D/AT/LT	1 hour FR doors with delayed action closers; electromagnetic detents with time delay overide locked with cylinder dead lock with key/thumbturn (on inside face).
FR1 / BG	1 hr. fire door with BG bolts.
FR1 / 1BG	1 hr. fire door with BG bolt on inside face only.
FR1 / A/S	1 hr. fire door with electro magnetic detents linked to fire alarm - linked to security alarm.
FR1 / A	1 hr. fire door with electro magnetic detents linked to fire alarm.
FR1 / D	1 hr. fire door with delayed action closer.

Nucleus Fire Plan Symbols

Doors and Ironmongery

1 HOUR FIRE RESISTANT DOORS (cont.)

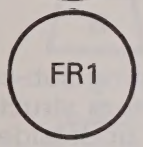
1 hr. fire door - roller shutter, linked to fire alarm system.



1 hr. fire door in fire and smoke breaks within ceiling void.

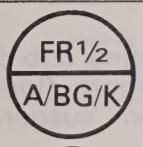
1 hr. fire door with lock by specialists (Catering).

1 hour FR doors, normally kept locked with escape lock. Key operated from both sides.



1 hr. fire door.

½ HOUR FIRE RESISTANT DOORS



½ hr. fire door with electro magnetic detents linked to fire alarm. Key operated from both sides.

½ hr. fire door with delayed action self closer, BG bolts. Key operated from both sides.

½ hour FR doors with delayed action closers; electromagnetic detents with time delay overide with cylinder dead lock with key/ thumbturn (on Staff Base side).

As above except BG bolt on inside face only.

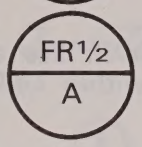
½ hr. fire door with BG bolt on inside face only, key operated both sides.

½ hr. fire door without self closer-locked with BG bolt, key operated from X-Ray department.

½ hour FR doors with delayed action closers and escape lock key operated from both sides.

½ HOUR FIRE RESISTANT DOORS

½ hr. fire door with electro-magnetic detents linked to fire alarm - door linked to security alarm.



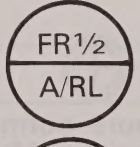
½ hr. fire door with electro-magnetic detents linked to fire alarm.

½ hour FR doors with delayed action closers with mortice lock with thumbturn on one side only.

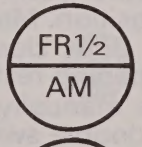
½ hr. fire door with delayed action closer and lock.

½ hr. fire door with delayed action closer.

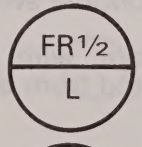
½ hr. fire door, normally kept locked with escape lock. Key operated from both sides.



½ hr. fire door - roller shutter linked to fire alarm system.



½ hr. fire door with electro-magnetic detents linked to fire alarm and override switch.

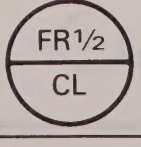


½ hr. fire door with lock.

½ hour FR doors, not self closing.

½ hr. fire door, not self closing, with lock.

½ hr. fire door - roller shutter with lock.



½ hr. fire door with cylinder lock.

Nucleus Fire Plan Symbols

Doors and Ironmongery Partitions and Ceilings

½ HOUR FIRE RESISTANT DOORS (cont.)

FR½ / H/NSC	½ hr. fire door - hatch, not self closing.
FR½ / CV	½ hr. fire door in fire and smoke breaks within ceiling void.
FR½ / SP	½ hr. fire resistant sliding door by lift specialists.
FR½ / SO	½ hr. fire resistant doors with stand open retainers.
FR½ / S	½ hr. fire resistant sliding door.
FR½	½ hr. fire door.

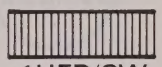
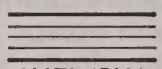
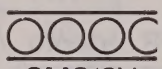
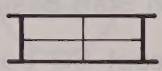
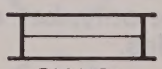
SMOKE STOP DOORS

S/S / S/M	Smoke stop doors normally in stand open position. Manually released. Self closing with one way opening restrictor which can be manually released to allow double swing.
S/S / BG/K	Smoke stop door with BG bolts, key operated from both sides.
S/S / L	Smoke stop door with overhead closer and lock.
S/S/D	Smoke stop doors normally in closed position with delayed action closer.
S/R / SO	Smoke stop door with stand open retainers.
S/S	Smoke stop door.

PARTITIONS EXTERNAL

	With 1 hr. fire resistance from inside face. Generally non combustible construction. Class O surface spread of flame on both faces.

PARTITIONS INTERNAL

 1HFR/CW	One hour fire resisting compartment wall from structural floor slab to underside of roof tiles. Compartment wall and roof junctions to be in accordance with Building Regulations.
 1HFR/SW	1 hr. fire resisting sub-compartment wall from structural floor slab to underside of roofing tiles.
½HFR/SW	½ hr. fire resisting sub-compartment wall from structural floor slab to underside of roofing tiles.
½HFR/SW/FCL	½ hr. fire resisting sub-compartment wall from floor to ½ HFR sealed suspended ceiling.
 SMS/CV	½ hr. fire resisting smoke stop within ceiling void. Construction to follow Eng. Services installation.
 ½HFR/GL	½ hr. fire resisting fixed glazing where essential for supervision.
 GW/GL	Georgian wired glazing where shown along the circulation/area which also forms part of an escape route.

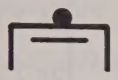
CEILINGS

	600 x 600mm access panel in suspended ceiling.

Nucleus Fire Plan Symbols

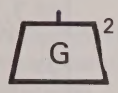
Equipment, Engineering and Electrical

EQUIPMENT

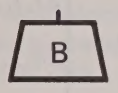

Electromagnetic door detent.

Hose reel.

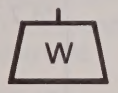
Portable fire extinguisher (Project option)



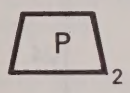
Portable fire extinguisher (CO_2 - 2.2 kg).



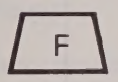
Fire blanket.



Portable fire extinguisher (Water).



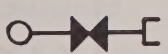
Portable fire extinguisher (dry powder 3.6 kg).



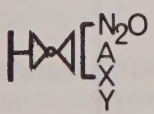
Portable fire extinguisher (foam).

ENGINEERING - MECHANICAL

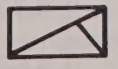
Air inlet grill with fusible link, fire damper behind.


Fire - main landing valve (female).

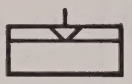
Fire - main landing valve (male).

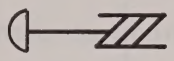


Medical gas isolating valve.


Pressure relief damper.

ENGINEERING (cont.)


Openable windows in each module - min. 2.5% of the plan area.


Fire damper.

Pneumatic fire damper, floor level.

ENGINEERING - ELECTRICAL

Fire alarm push.

Fire alarm bell.

Alarm buzzer.

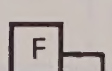
Smoke detector.

Heat detector.

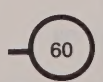
Foam inlet.

Fire alarm attenuating switch.

Fire alarm indicator light.



Fireman's switch at door head height.



External light fitting - linked to emergency circuit.

Schedule of standard Nucleus Fire Plans contained in Volume 1 - Green Pack of fire drawings.

Title	Number	Revision	Date
Adult Acute (Nursing Section) with double pitched roof cover	F.P.1	J	24.7.78
ITU/Day-care/Treatment Suite with single pitched roof cover	F.P.2	H	24.7.78
Operating (4 theatre Suite)	F.P.3	J	24.7.78
Childrens Nursing Section ground floor intermediate location between pharmacy and childrens ward	F.P.4	F	24.7.78
Rehabilitation/Pharmacy/Main-wait/Central Staff Change	F.P.6	D	24.7.78
Outpatient Department/Medical Records/Laboratory Services	F.P.7	D	24.7.78
Accident and Emergency/Fracture Clinic	F.P.8	D	24.7.78
X-ray Department (4RDR)/Administration/Library Meeting Suite	F.P.9	E	27.7.78
Supplies Distribution Centre	F.P.10	E	27.7.78
Catering/HSDU	F.P.11	D	27.7.78
Childrens/Adult Acute Combined Nursing Sections	F.P.12	F	24.7.78
Street Fire Plan Ground and first floor	F.P.13	D	24.7.78
Street Fire Plan Ground and first floor linking Supplies and Services block.	F.P.14	E	24.7.78
Street Fire Plan Roof top Plantrooms 1 & 2 and stair block	F.P.15	E	24.7.78
Street Fire Plan Roof top Plantrooms 3 & 4 and stair lift blocks	F.P.16	D	28.4.78
Street Fire Plan Roof top Lift Motor Room (Supplies and Services block)	F.P.17	C	13.12.77
Plantroom 5 & 6	F.P.18	H	24.7.78
Maternity (Ante and Post-Natal Nursing Sections) first floor location with double pitched roof over .	F.P.19	B	24.7.78
N.B. This is not included in the overall DCP shown on drawings FP21, 22 & 23; however, it can be substituted for any suitable nursing section.			
Street Fire Plan ground and first floor	F.P.20	D	28.4.78
Fire Plan First Phase, Ground floor showing interlinking of fire compartments and sub-compartments and exits to outside.	F.P.21	D	9.5.78
Fire Plan First Phase, First Floor showing interlinking of compartments and sub-compartments	F.P.22	G	9.5.78
Roof Level Fire Plan Phase 1 - this drawing shows a typical double pitch roof solution.	F.P.23	F	4.10.77
Central Delivery Suite and Special Baby Unit	F.P.24	B	8.3.79
Obstetric Clinic maternity Administration/Education, Library/Meeting Suite	F.P.25	B	8.5.79

Schedule of standard Nucleus fire plans contained in Volume 2 - Green Pack of fire drawings

Title	Number	Revision	Date
Service Centre and Hospital Streets	FP/NHM2/03		11/86
Service Centre	FP/NHM2/04		11/86
Adult Acute Ward			
up to suspended ceiling level	5/FP/100		03/85
ceiling void	5/FP/101		03/85
Childrens Ward			
up to suspended ceiling level	8/FP/103		03/85
ceiling void	8/FP/104		03/85
Childrens/Adult Acute			
up to suspended ceiling level	9/FP/109		11/85
ceiling void	9/FP/110		11/85
Ante Natal/Post Natal			
up to suspended ceiling level	11/FP/111		03/86
ceiling void	11/FP/112		03/86
Post Natal Wards			
up to suspended ceiling level	12/FP/113		11/85
ceiling void	12/FP/114		11/85
Ante Natal/Adult Acute			
up to suspended ceiling level	13/FP/115		11/85
ceiling void	13/FP/116		11/85
Ante Natal/Childrens			
up to suspended ceiling level	14/FP/117		11/85
ceiling void	14/FP/118		11/85
Wards for the Elderly Type A			
up to suspended ceiling level	16/FP/105		03/86
ceiling void	16/FP/106		03/86
Wards for the Elderly Type B			
up to suspended ceiling level	17/FP/107		03/86
ceiling void	17/FP/108		03/86
Operating (4 theatres)			
up to suspended ceiling level	21/FP/100		04/86
ceiling void	21/FP/101		04/86
Pharmacy 1200 beds			
up to suspended ceiling level	22/FP/123		09/86
ceiling void	22/FP/124		09/86
Decentralised Staff Changing Pods			
up to suspended ceiling level	23/FP/125		12/86
	23/FP/126		12/86
ceiling void	23/FP/127		12/86
	23/FP/128		12/86
Catering 600 kitchen (restaurant 300)			
up to suspended ceiling level	24/FP/121		12/86
ceiling void	24/FP/122		12/86
Catering 1200 kitchen (restaurant 600)			
up to suspended ceiling	26/27/FP/119		12/86
ceiling void	26/27/FP/120		12/86
Single template A.A. Ward on 1st floor			
Up to suspended ceiling level	5/FP/129		6/88
Ceiling void	5/FP/130		6/88

Appendix 3 Risk Categories of Hospital Departments

Reproduced from HTM 81 and amended as shown in Notes ① and ②.

DEPARTMENT	RISK			HIGH FIRE LOAD	DEPARTMENT	RISK			HIGH FIRE LOAD
	HIGH LIFE	LOW LIFE	HIGH FIRE	(Should be sited away from life risk depts)		HIGH LIFE	LOW LIFE	HIGH FIRE	(Should be sited away from life risk depts)
Accident & Emergency	•				① (Medical) Health Records		•		•
Administration		•			② Mental Illness Unit	•		•	
Ambulance Station		•			Mortuary & Post Mortem Room		•		
Boiler House			•	•	Occupational Therapy	•			
Catering:-					Operating	•			
Kitchen			•	•	Outpatients	•			
Dining Room		•			Pathology			•	
Central Sterile Supply				•	Patients Services		•	•	•
Community Hospital	•				Pharmaceutical		•		
Day Hospital	•				Pharmaceutical (Manufacturing)				•
Dental Workshop		•			Radiotherapy Unit	•			
Diagnostic X-Ray	•				Refuse Collection Disposal Area incineration			•	•
Education					Rehabilitation	•			
Nurse training School	•				Renal Units	•			
Post-graduate Medical Education	•				Residential Accommodation for Staff	•			
Health Centres		•			Neo Natal Unit	•			
Hospital Sterilising and Disinfecting Unit			•	•	Staff Changing			•	
Intensive Therapy Unit and Coronary Care Unit	•				Stores:-				
Laundry			•	•	Main Store			•	•
Main Electrical Gear (Transformer Switch etc)			•	•	Flammable Store			•	•
Maternity nursing Section including Delivery Suite	•				Medical Gas Store			•	•
Medical Photography		•			Telephone Exchange		•		
					Theatre Sterile Supply Unit		•		
					Wards	•			
					Works			•	•

Notes:-

① Paragraphs 1.9 to 1.12 in this document and HBN 47 Health Records Department both refer to these revised risk categories i.e. office area - low life risk area.
case note library - high fire load area

② A new addition to the HTM 81 list - see paras 1.13 to 1.23 in this document and HBN35 Mental Illness Units.

Appendix 4 Construction Standards

A4.1 For compliance with The Building Regulations 1985 and Additional Statutory Provisions refer to HTM 81 Chapter 4.

A4.2 In order to meet the fire and smoke integrity called for in the horizontal escape strategy, the minimum constructional standards should also comply with HTM 81.

A4.3 Some of the major building elements which are deemed to satisfy fire and smoke integrity requirements in the Nucleus design system are indicated below; however alternative construction elements and details may be acceptable subject to the approval of the local fire authority.

Walls

A4.4 a) **Compartment Walls**

(i) All compartment walls should be in accordance with HTM 81 paragraphs 8.16 and 8.18.

(ii) All services passing through the street compartment walls should be fire stopped and ventilation services dampered. No services should pass through the compartment walls between adjacent departments.

(iii) Compartment wall/external cladding and roof junctions should be designed to limit fire transference from one side to the other. For external cladding junctions see HTM 81 appendix 4 and paragraph 11.12; for roof junctions see Approved Document B2/3/4 Appendix C and HTM 81 paragraph 11.13.

b) **Sub Compartment Walls**

(i) Sub-compartment walls should be in accordance with HTM 81 paragraphs 9.7 to 9.12

(ii) Sub-compartment walls and external cladding junctions should be in accordance with HTM 81 appendix 4 and paragraph 11.12

c) **Fire Walls to Fire Hazard Rooms and Areas**

These should be in accordance with HTM 81 paragraphs 14.2 and 14.3 a, b, d and e.

d) **Glazing in Sub-compartment Walls**

(i) Where glazing is essential for supervision this should be half hour fire resistance standard, extending from windowsill level to 2,100mm (door head level).

(ii) Glazing should be in accordance with BS 6262 1982.

e) **Cavity Barriers**

These should be in accordance with HTM 81 paragraphs 11.34 to 11.36.

f) **Internal Partitions (not fire rated)**

(i) These should extend from floor to suspended ceiling, be non-combustible, hollow construction.

(ii) Services drops should be contained within the wall void.

(iii) Internal surfaces and finishes should be in accordance with HTM 81 paragraphs 11.22 to 11.28.

Suspended Ceilings

A4.5 Suspended ceilings should be in accordance with HTM 81 paragraphs 11.30 to 11.32.

Flooring

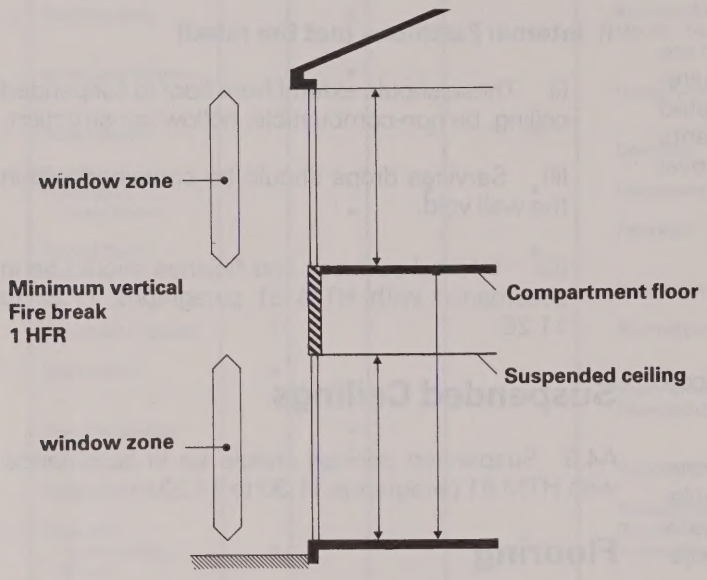
A4.6 This will generally be carpet or similar soft covering, bonded to power floated concrete slab or floor screed, or where required, vinyl covering.

External Cladding

A4.7 See HTM 81 Chapter 6 and paragraphs 11.12, 11.21, 4.10, 4.11 and 4.12.

Vertical Fire-break

A vertical fire-break at the junction of compartment floor and external cladding is necessary to prevent or limit the external fire spread to the compartment above. Therefore it is recommended that the part of external cladding between the lower floor suspended ceiling and the upper floor compartment slab, as shown in the diagram below, should be one hour fire resisting.



Vertical fire break required between 2 floors.

Roof Construction

A4.8 See Approved Document B2/3/4 and HTM 81 paragraphs 11.13 and 11.14.

Fire and Smoke-Stop Doors

A4.9 a) Compartment doors in compartment walls should have the same fire resistance rating as the walls - generally one hour in a life risk complex.

b) Sub-compartment doors are required to be half hour FR standard.

c) All fire doors must be self-closing.

d) Where day-to-day user requirement necessitates that a self-closing fire door be kept open (except doors to stairways), provision of auto-release doors linked to the fire alarm system is essential.

e) Fire doors, which are also exit doors, must not be locked unless provided with break-glass automatic release door locks.

f) Exit doors should open in line with the direction of exit routes. Where the exit route could be in either direction, double swing doors should be provided.

g) In addition to fire resisting doors, smoke-stop doors may be required to avoid smoke-logging of large spaces.

h) Standards for testing the fire resistance of doors should be to BS476 Part 8 (1972) and Parts 20-22.

i) Smoke stop doors should have 30 minutes stability and 20 minutes integrity when tested in accordance with BS476 Part 8 (1972).

j) Corridor doors should be provided with vision panels having the same fire resistance as the doors themselves.

k) Fire door ironmongery. An example only is shown on the standard Nucleus fire plans. Actual specification is a project decision and will depend upon both fire safety and security.

Appendix 5 - Extracts from Project Information Bulletins covering Fire Precautions guidance which is still current.

Project Information Bulletins Numbers 5, 6, 10, 11, 14,16, 19 and 21 issued since Nucleus Fire Precautions Recommendations 1979 have contained guidance on Fire Precautions. Most of this guidance has either been incorporated in or is superseded by this new document. However those parts of P.I.B.s 6, 10, 14, and 21 that have not been covered in the main body of the text are reproduced verbatim in this Appendix and have been cross-referenced in the headings to the appropriate sections of this new guidance document.

P.I.B. No. 6 April 1983

Smoke Extract System - Appendix 6 in new document refers

Appendix 4 of the Nucleus "Fire Precautions Recommendations" document provides guidance on the design of a mechanical smoke clearance system for the hospital street. Figure I shows a typical arrangement below plant room level. In practice the vertical duct can act as a chimney and its "stack effect" may be significant particularly when the outside ambient temperature is low. This can cause unnecessarily high air change rates in the street and increase the amount of energy needed for space heating. Environmental conditions within the street might also suffer.

This phenomenon was experienced at the Nucleus Hospital at West Cheshire which was recently commissioned and consequential modifications have already been carried out on the smoke extract systems.

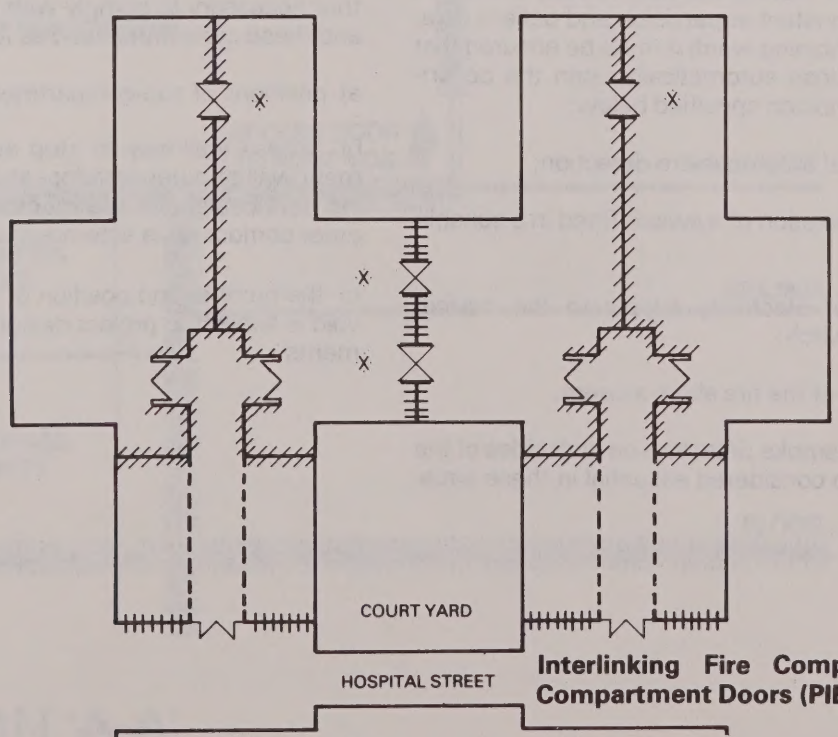
The problem can be overcome by installing a flap type damper or similar, preferably on the discharge side of the fan. This will also prevent back draught. Such a unit must be carefully selected since its operation is vital on start-up of the extract fan and it must be finely balanced to ensure that it remains shut against buoyancy forces in the duct.

The Department is investigating other measures including the use of piston operated dampers with a single extract fan to serve all departmental interfaces on a particular section of the street. The results of this work will be promulgated in due course.

P.I.B. No. 10 September 1984 - Paragraph 3.9 in new document refers

1. Fire compartment doors linking cruciform templates

1.1 Home Office Fire Service Inspectorate (HOFSI) have visited some of the completed Nucleus projects and have expressed their concern about certain aspects of fire precautions observed in one or two hospitals.



Interlinking Fire Compartment/Sub-Compartment Doors (PIB 10)

Diagram showing two adult acute ward templates and interlinking fire compartment/sub compartment doors (marked ⁂), compartment walls (marked IIIIII) and sub-compartment walls (marked ////).

1.2 The fire doors (identified by X on the diagram) were originally intended for emergency evacuation purposes only and appropriate ironmongery was specified. In some projects it was noticed that staff were using them in their normal work routine.

1.3 From the fire precautions aspect there are two distinct types of door user requirements which need to be considered separately as regards fire provisions. The conditions which are essential to each type are as follows:-

a) Fire doors which are used for staff movement without being propped open: Whilst there is no objection to this principle, they are one hour or ½ hour fire resisting compartment/sub compartment doors and where they are so used the following condition must always be complied with: the doors must remain open only during the passage of a person. At all other times they must be in the fully closed position and serve as a one hour or ½ hour fire barrier. It is not acceptable to have a turned lock preventing full closure of the doors - which was found in one instance by the HOFSI.

b) Fire compartment/sub compartment doors which are held open by automatic self closing devices: it is important to restrict hold-open devices in these situations to an absolute minimum, to ensure that this practice is not introduced on a large scale within any one hospital complex. It is suggested, therefore, that the local fire brigade be consulted on each occasion where such devices are proposed to be used to ensure a reasonable measure of control in this respect.

However, where, in consultation with the local fire authority, it is considered essential to permit the use of automatic self closing devices to hold the doors open to allow constant supervision and patient care, (e.g. from the adjoining ward) it must be ensured that the doors will close automatically upon the occurrence of each condition specified below:

(i) operation of automatic fire detection;

(ii) manual operation of a switch fitted in a suitable position;

(iii) failure of electricity supply to the device, apparatus or switch;

(iv) operation of the fire alarm system.

The provision of smoke detectors on both sides of the fire doors is also considered essential in these situations.

3. Escape requirements from roof voids with access walkways - Paragraph 3.39 in new document refers

3.1 Queries have been raised by RHAs on the information contained in Nucleus Projects Information Bulletin No. 7 in relation to:

(i) the application of Building Regulations, Section E 14, Cavity Barriers;

(ii) the relationship between the agreed fire plan for the operating department and the key plan contained in the bulletin;

(iii) the recommendation that only authorised personnel with a 'Permit to work' should be allowed to work in these roof void areas.

3.2 These queries have been discussed with the Home Office Fire Service Inspectorate (HOFSI) and the agreements reached are recorded as follows:-

(i) With the complexity of engineering services over the operating theatre area and with access from the roof void only, the provision of cavity barriers in this area was impracticable. In the theatre area patients are always under staff supervision and the roof void engineering access is restricted to authorised personnel only. It was therefore agreed in November 1976 to delete the cavity barrier requirements and this is noted under Rev 'D' to FP No 3 dated 30 November 1976.

(ii) The 1:50 scale fire plan FP No. 3 Rev J dated 24 July 1978 records the current approved fire precautions for the operating department. Amendments to the roof void key plan issued in PIB No. 7 are therefore necessary to comply with the agreed fire plans and these are summarised as follows:-

a) positions of sub-compartment walls revised;

b) access walkway to stop at inner sub-compartment wall of outer corridor - access to the engineering services above the medical staff area and the outer corridor is via a demountable ceiling;

c) the number and position of fire doors in the roof void is subject to project design and access requirements.

3.3 Commentary

In Nucleus Fire Precaution Recommendations - First Edition, February 1979 the constructional standards set out at para 18a, page 2/12, assume a demountable ceiling with access for service from below. This has been provided for in most of the standard Nucleus departments. However, because of the extensive engineering as well as clinical requirements the standard operating theatre department has an extensive area of sealed ceiling and an access walkway to engineering services within the roof void.

Additional Recommendations

3.4 Some of the completed projects with roof voids and access walkways have been inspected by the Home Office Fire Service Inspectorate and the following recommendations have been made:-

a) Each fire sub compartment within the roof void with maintenance access walkway should be provided with an alternative means of escape.

b) Where the maximum travel distance does not exceed 15 metres and the travel route does not pass through a significant fire-risk area, the alternative fire exit may not be required.

c) Means of escape exits are required for able bodied personnel only, therefore they can be via either:-

(i) trap door with exit ladder to a place of safety;
or
(ii) other approved exit route over a roof area.

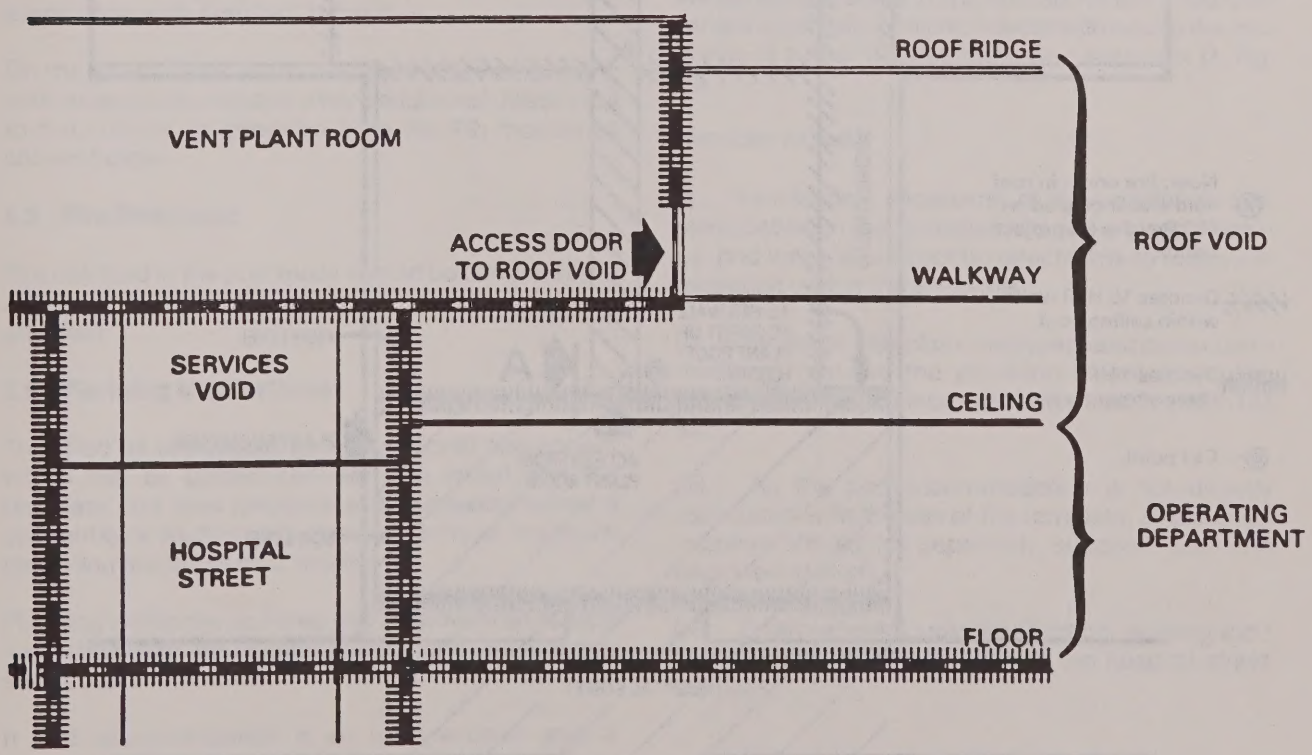
d) When a fire escape route is being planned, the intervening doors and locking arrangements should be such as to allow fire exit 24 hours a day.

e) The maintenance and repair policy should clearly define and establish the safety procedures to be adopted by employees undertaking work within this type of engineering service void. Access should be classified in the Regional Health and Safety Policy Statement as "Restricted to authorised personnel only".

f) Exits from the roof void space should be provided with fire alarm call points and sounders should be provided if found to be necessary after audibility tests.

3.5 A key plan of the standard operating theatre department showing the suggested modifications at paragraph 3.2 above and a trap door/ladder exit from the end module furthest away from the street is attached.

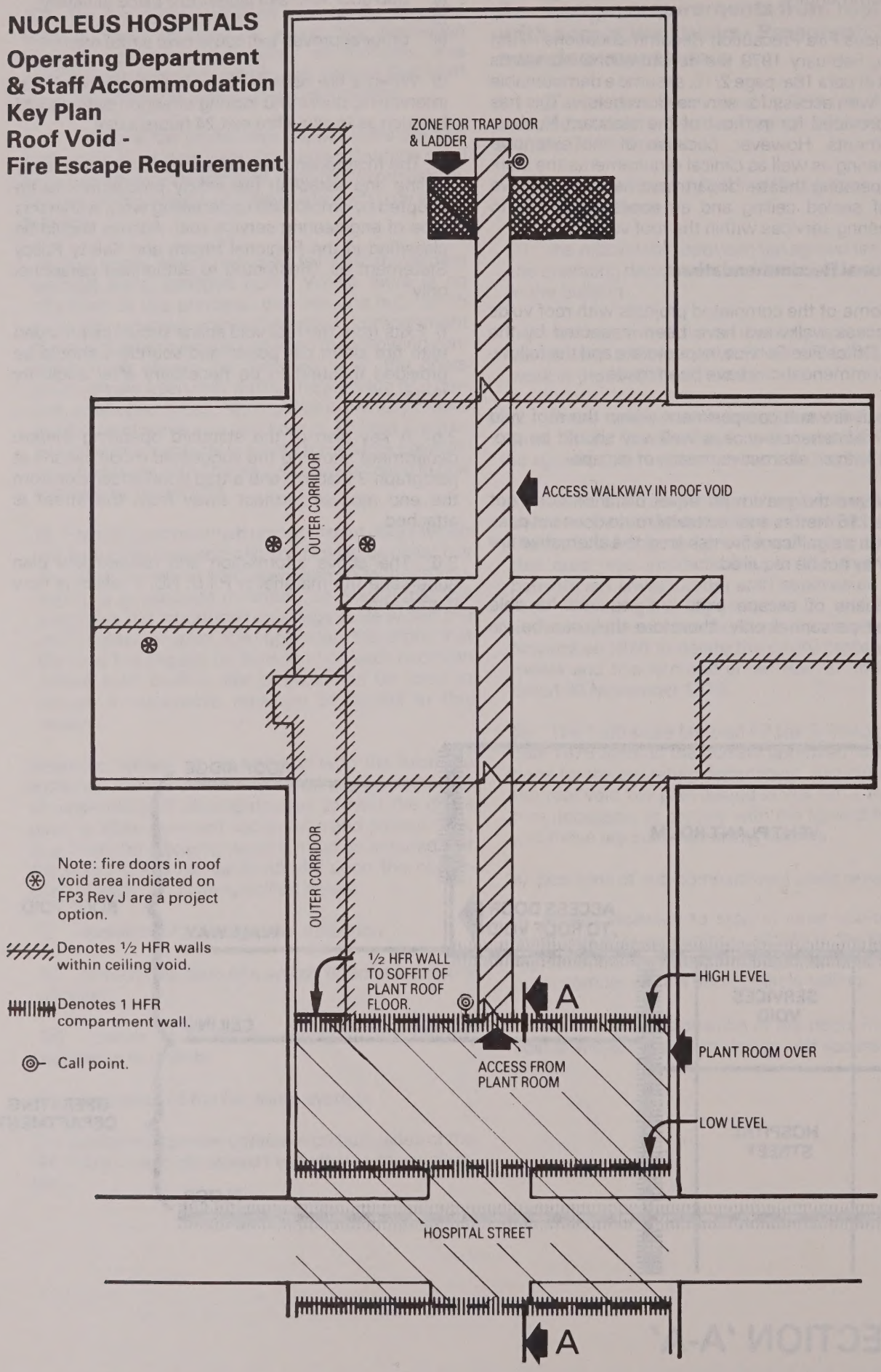
3.6 The above information and revised key plan supersede the material in P.I.B. No. 7 which is now withdrawn.



SECTION 'A-A'

NUCLEUS HOSPITALS

Operating Department & Staff Accommodation Key Plan Roof Void - Fire Escape Requirement


ZONE FOR TRAP DOOR & LADDER
ACCESS WALKWAY IN ROOF VOID
OUTER CORRIDOR
OUTER CORRIDOR
Note: fire doors in roof void area indicated on FP3 Rev J are a project option.
Denotes ½ HFR walls within ceiling void.
Denotes 1 HFR compartment wall.
Call point.
½ HFR WALL TO SOFFIT OF PLANT ROOF FLOOR.
A
HIGH LEVEL
PLANT ROOM OVER
ACCESS FROM PLANT ROOM
LOW LEVEL
HOSPITAL STREET
A

P.I.B. No. 14 September 1986 - Paragraph 2.8 in new document refers

For general design guidance on accommodation pods see Nucleus Design published April 1987. The Fire Precautions requirements are reproduced below:

5. Fire Precautions Requirements

The planning of pod and extended template accommodation should only be considered within the following parameters:

5.1 Function

The pod accommodation should only contain:-

Accommodation which is functionally compatible with the adjoining template, and/or

staircases, lifts and service ducts which are contained in their own vertical protected shafts. (See Appendices B and D).

5.2 Location

Accommodation pods can be placed only at the hospital street/template interface i.e. No pod accommodation (except stairs and lifts) in the hospital street/courtyard interface.

Pods can be placed on one or both sides of the hospital street.

On upper floors generally, pods can be placed only in association with standard templates.

On the ground floor, pods can be placed in association with extended templates where additional direct exits to the outside are provided from the 4th module as shown below:-

5.3 Fire Risk/Load

Fire risk/load in the pod space should be compatible or similar to the template accommodation to which it is attached.

5.5 Planning Implications

The 'Pod' is introduced as an additional component which can be placed between the street and the template and thus presents to the hospital street a conventional Nucleus interface in terms of fire resistance and smoke extract facility.

Planning within the pod area should provide an escape route between the template door and the hospital street door.

If pod accommodation is an unsupervised area it should have an appropriate fire resisting enclosure and automatic smoke detection (see Appendix B).

Standard template fire plans and the accommodation pod:

the pod accommodation is primarily for individual project design and there may be consequential modifications to the activity spaces within the standard template which abut the pod accommodation. Therefore the fire plan for those areas will need to be co-ordinated with that of the standard template and agreed with the local fire authority. A typical example is shown in Appendix A.

5.6 Hospital Street

The hospital street sub-compartment which faces the two courtyards must act as a cross-ventilated lobby to the vertical protected shafts of stairs and lifts. (See Appendix B figure 13.)

The exit from the pod interface to the hospital street sub-compartment is limited to a single 1900 wide door set. (See Appendix A, figure 11.)

5.7 Engineering Services

Vertical Shafts

(i) The standard twin engineering service ducts at each hospital street/pod interface can be retained where the pod is used for accommodation. See Appendix B, Fig. 12.

(ii) Where the pod contains communications spaces such as lifts or staircases, which are protected shafts and thus must not be penetrated by services, the shaft arrangement needs to be modified as shown in Appendix B, Fig. 13.

As the vertical ducts in (i) and (ii) above are 1 hour protected shafts all ventilation ducts will require the provision of 1 hour fire dampers. See Appendix D, Fig. 15.

Services to pods

(i) Ventilation - separation of the ventilation systems between the template and pod are necessary - i.e. pod areas should not be directly linked to accommodation within the template.

(ii) Automatic detection - unsupervised pod accommodation requires the provision of automatic fire detection in accordance with Appendix B and HTM 82.

(iii) As the pod accommodation is not directly associated with the use of the template, all electrical supplies should be separately supplied from the engineering shaft.

(iv) Environmental services (lighting, heating etc.) to stairways will be served from the hospital street supplies.

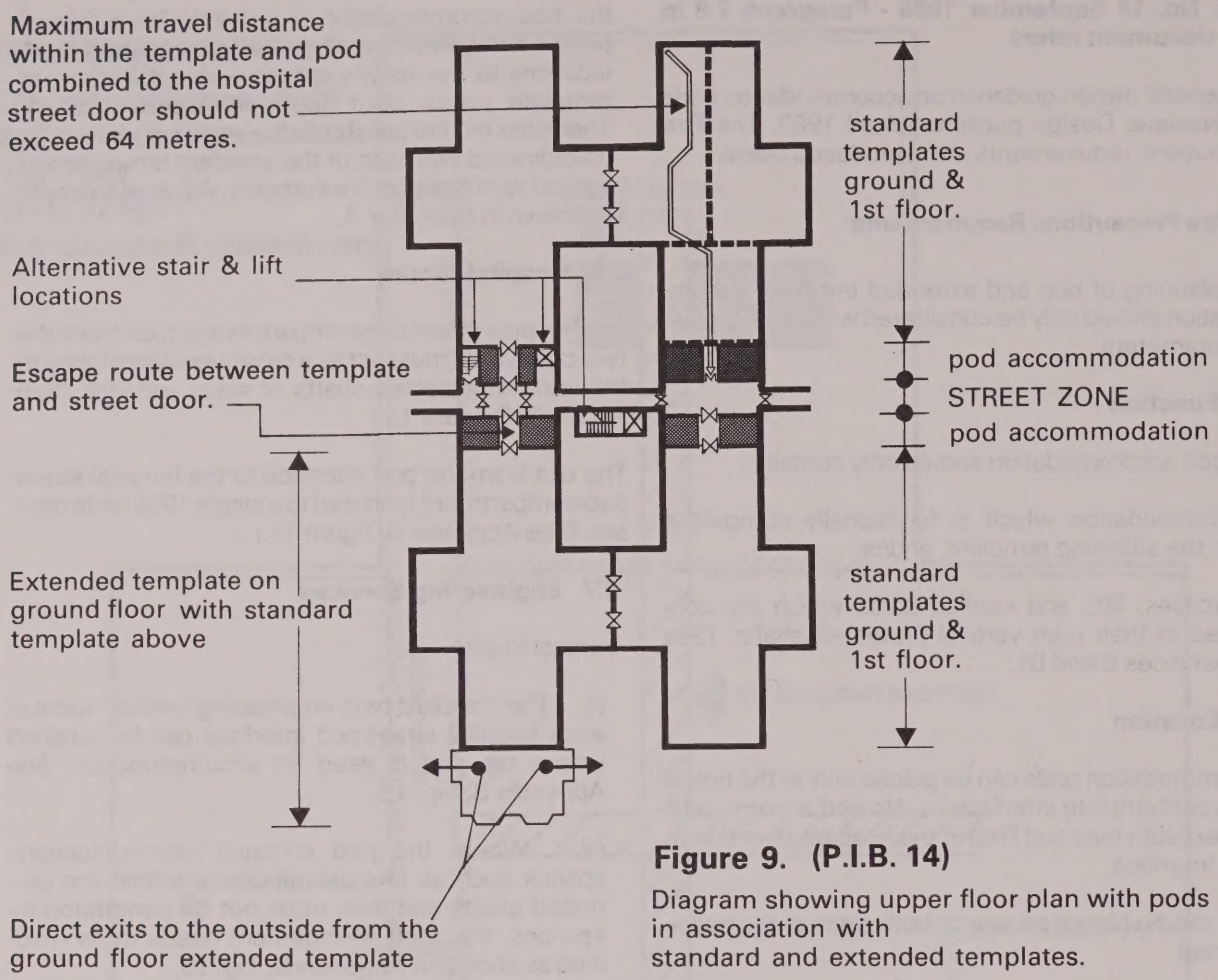

Maximum travel distance within the template and pod combined to the hospital street door should not exceed 64 metres.
Alternative stair & lift locations
Escape route between template and street door.
Extended template on ground floor with standard template above
Direct exits to the outside from the ground floor extended template
standard templates ground & 1st floor.
pod accommodation
STREET ZONE
pod accommodation
standard templates ground & 1st floor.

Figure 9. (P.I.B. 14)

Diagram showing upper floor plan with pods in association with standard and extended templates.

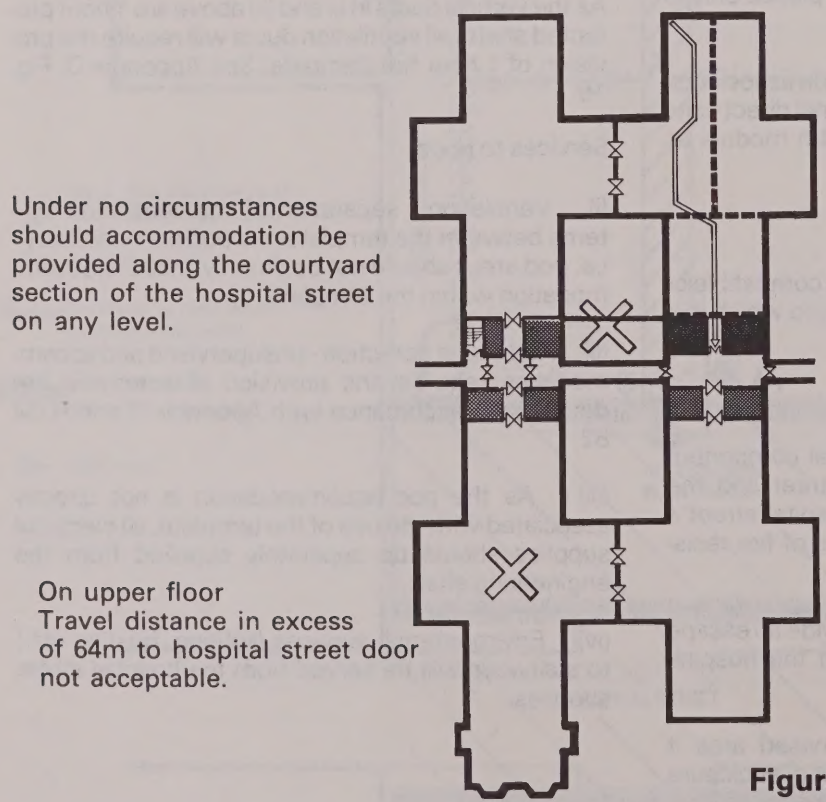

Under no circumstances should accommodation be provided along the courtyard section of the hospital street on any level.
On upper floor
Travel distance in excess of 64m to hospital street door not acceptable.

Figure 10. (P.I.B. 14)

Diagram showing unacceptable arrangement of pods and extended templates.

APPENDIX A (P.I.B. 14)
STANDARD TEMPLATE/POD/HOSPITAL STREET INTERFACE FIRE COMPARTMENTATION

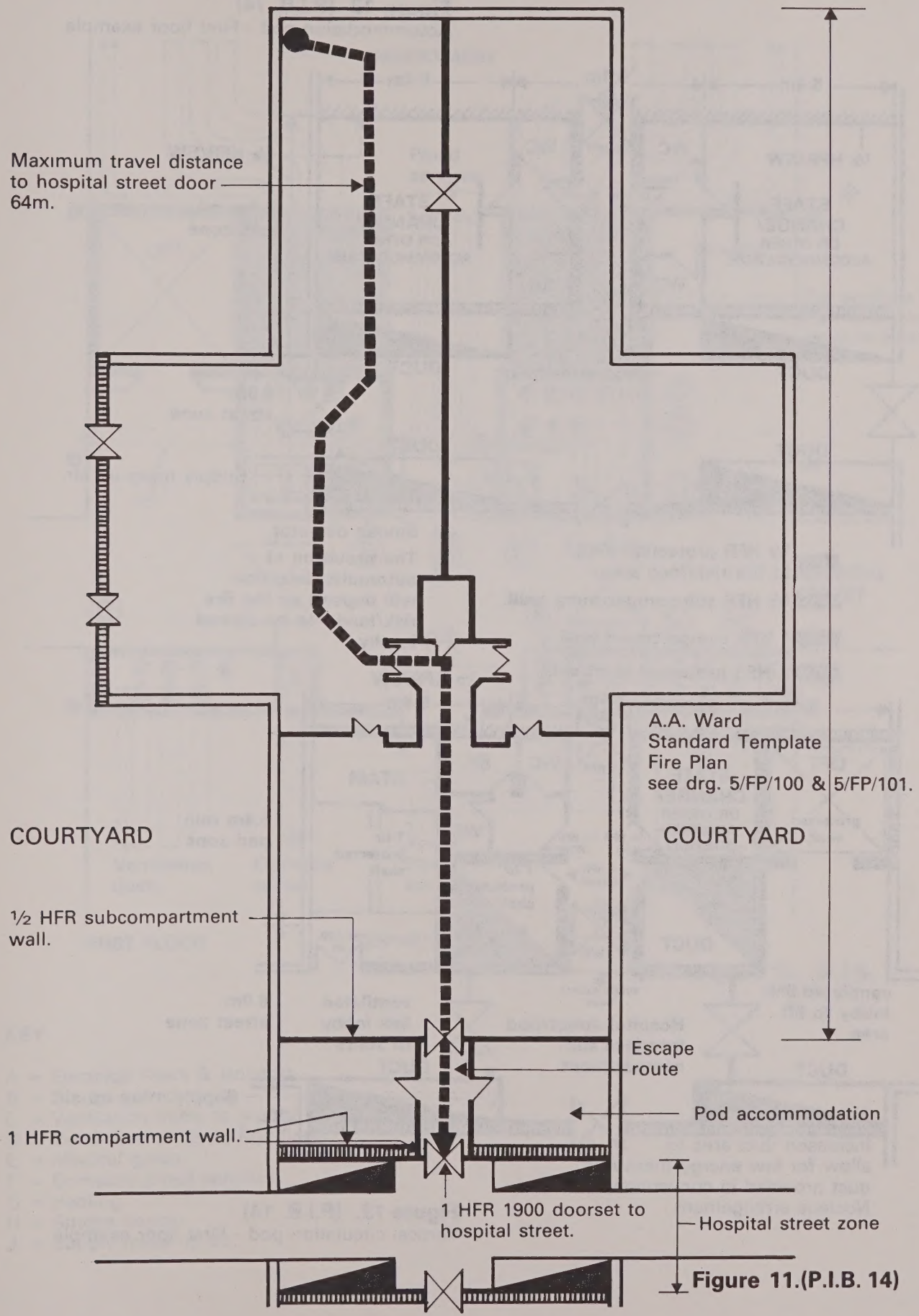
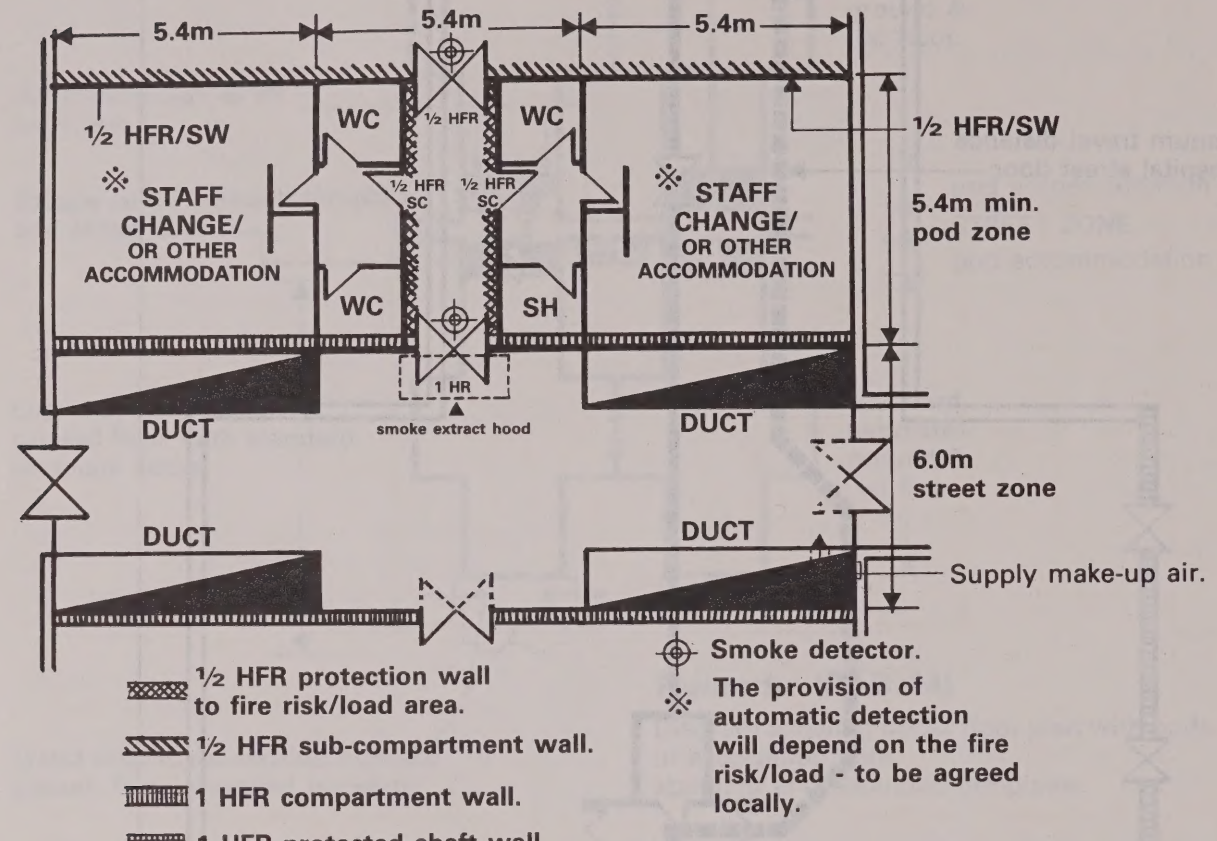

Maximum travel distance to hospital street door 64m.
A.A. Ward Standard Template Fire Plan see drg. 5/FP/100 & 5/FP/101.
COURTYARD
COURTYARD
½ HFR subcompartment wall.
Escape route
Pod accommodation
1 HFR compartment wall.
1 HFR 1900 doorset to hospital street.
Hospital street zone

Figure 11.(P.I.B. 14)

APPENDIX B (P.I.B. 14)
ACCOMMODATION AND VERTICAL CIRCULATION PODS

Figure 12 (P.I.B. 14)
Accommodation pod - First floor example



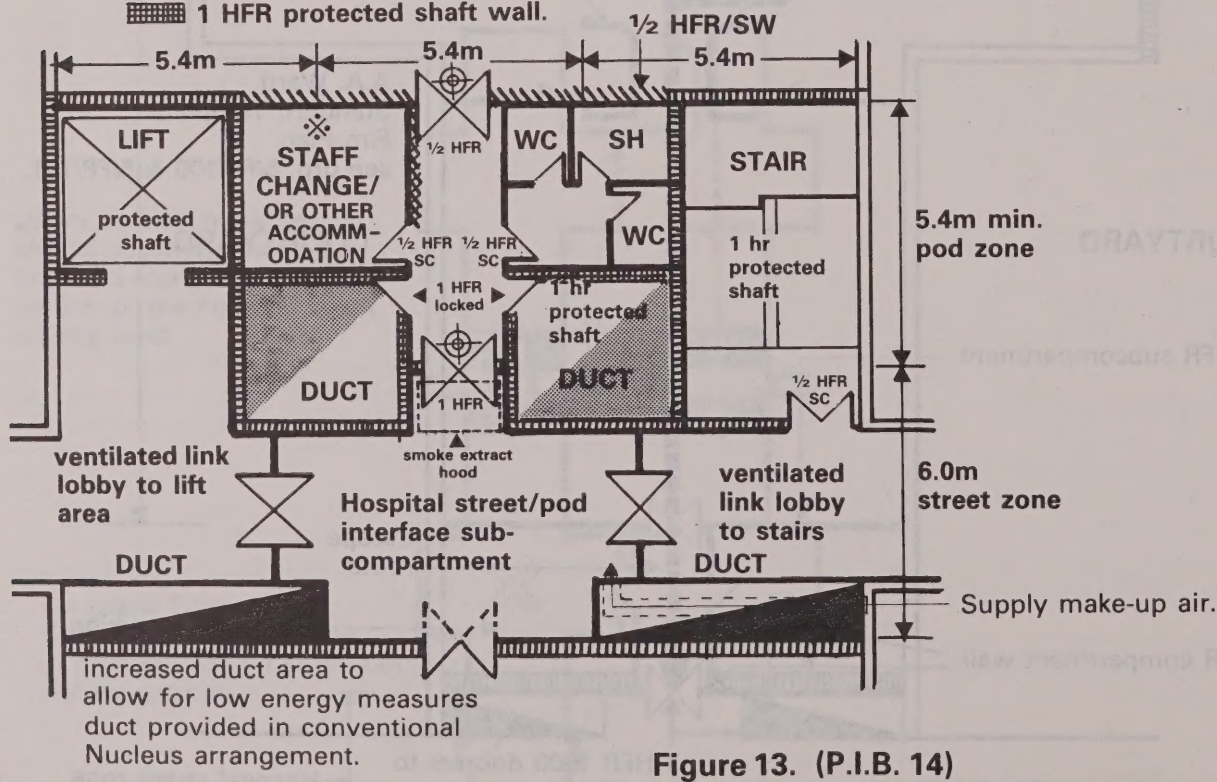


Figure 13. (P.I.B. 14)
Vertical circulation pod - First floor example

APPENDIX C (P.I.B. 14)
ZONING OF ENGINEERING SERVICES IN VERTICAL CIRCULATION POD

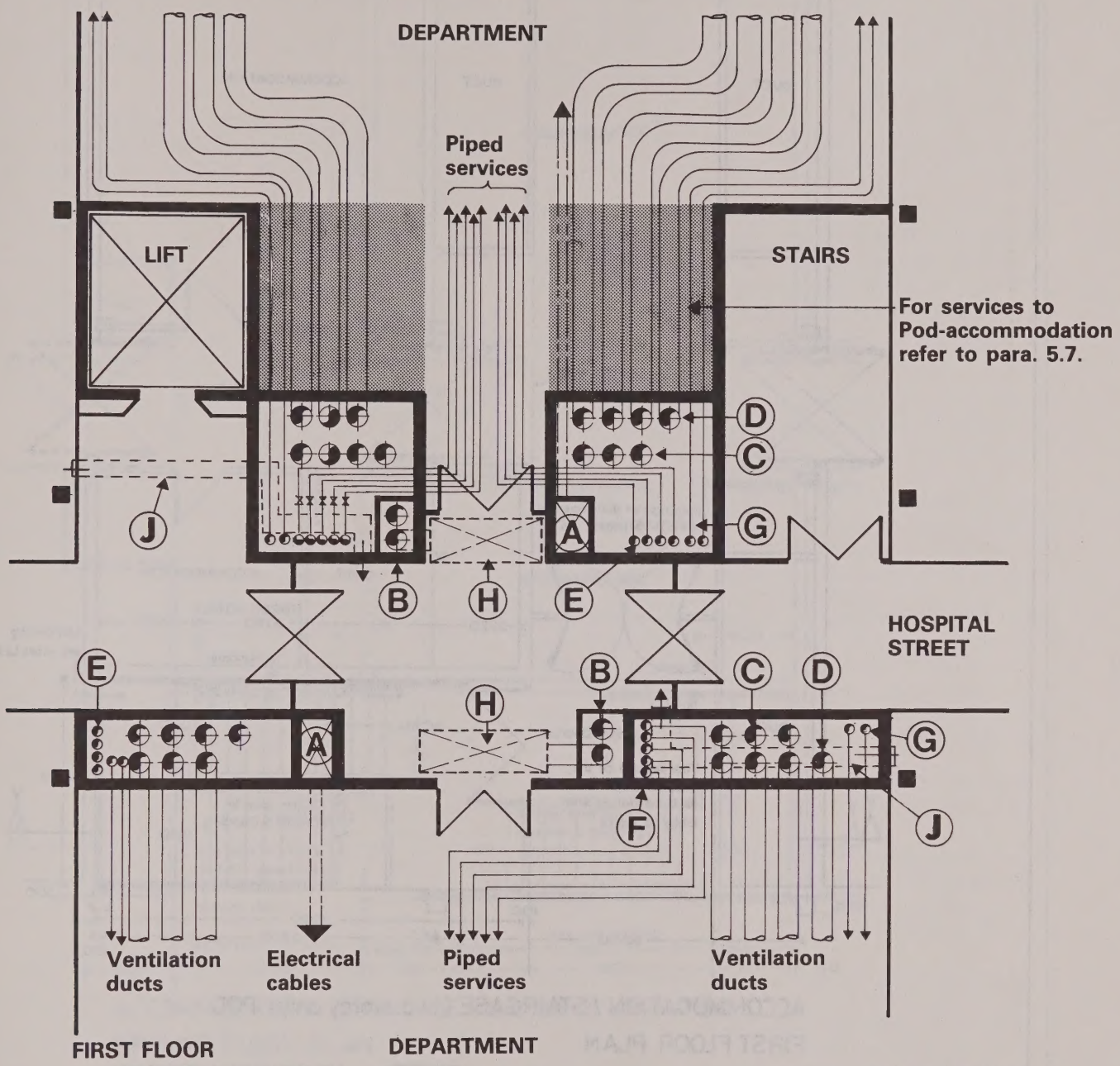
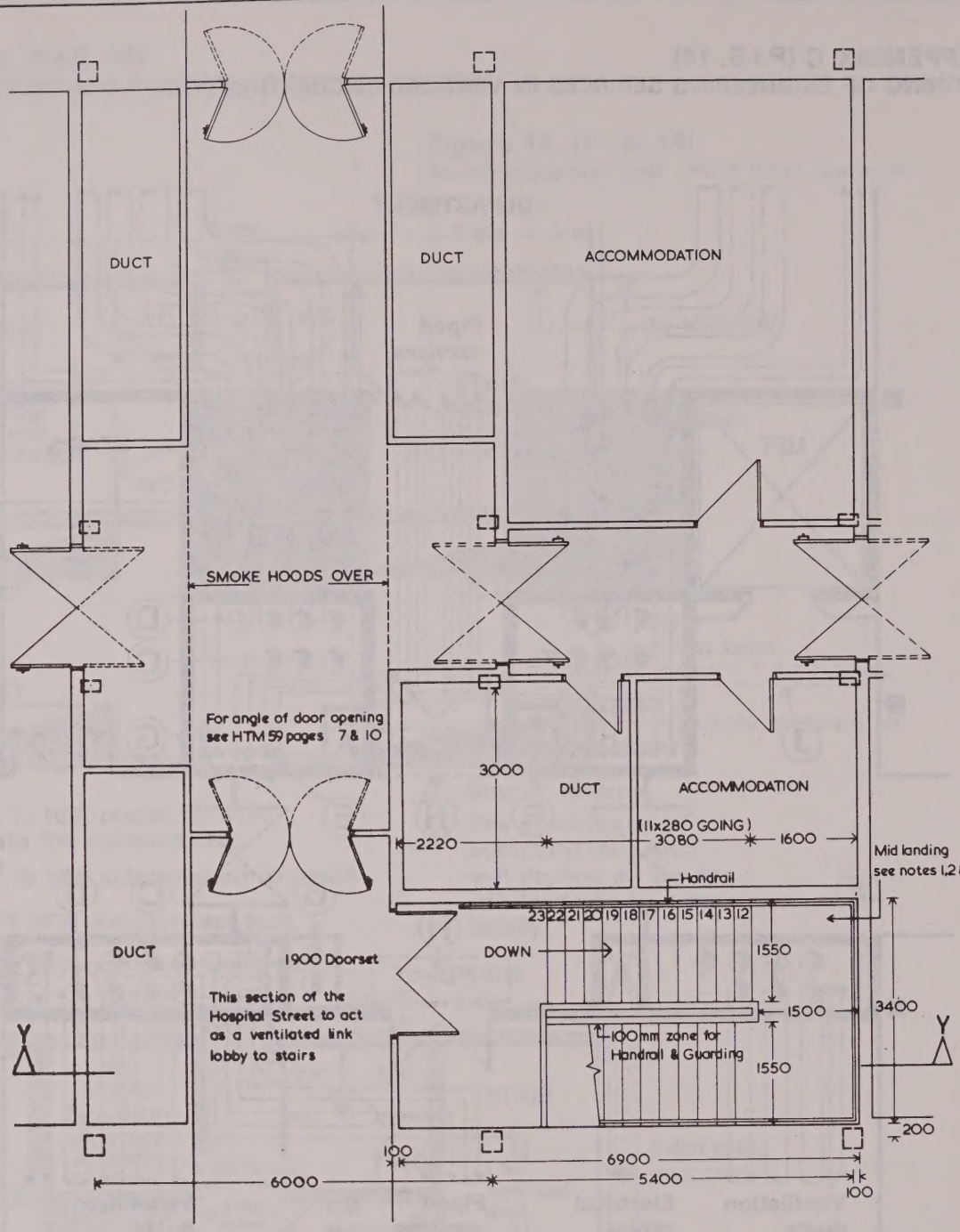


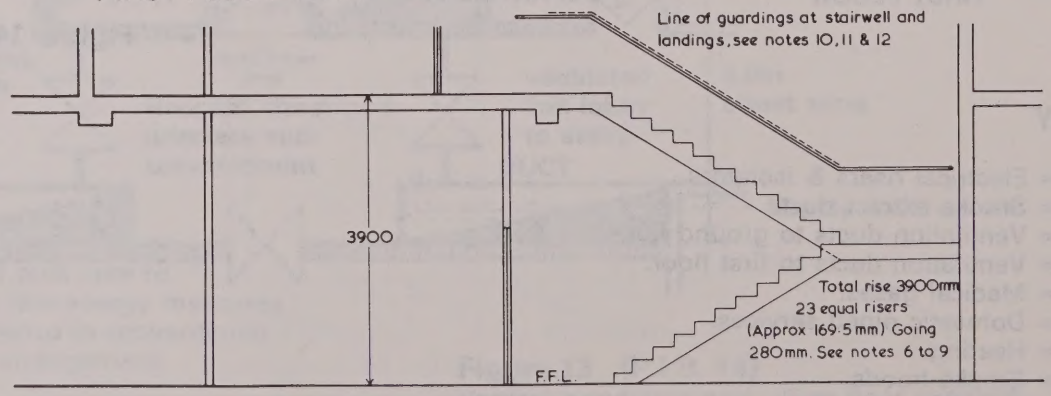
Figure 14. (P.I.B. 14)

KEY

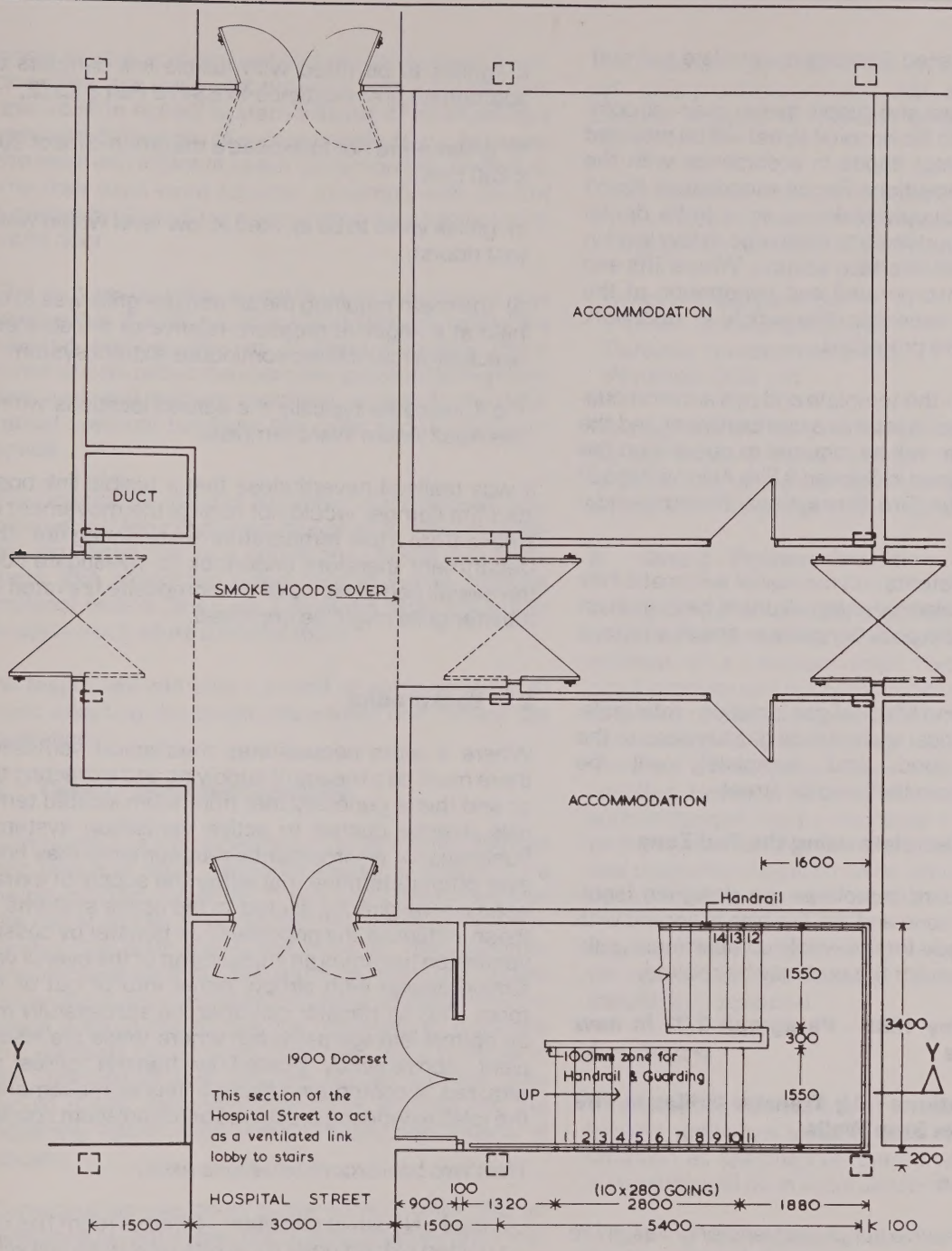
A = Electrical risers & isolators.
B = Smoke extract ducts.
C = Ventilation ducts to ground floor.
D = Ventilation ducts to first floor.
E = Medical gases.
F = Domestic piped services.
G = Heating.
H = Smoke hoods.
J = Supply make-up air.



ACCOMMODATION / STAIRCASE (two storey only) POD
FIRST FLOOR PLAN


Line of guardings at stairwell and landings, see notes 10, 11 & 12
3900
Total rise 3900mm
23 equal risers
(Approx 169.5 mm) Going
280mm. See notes 6 to 9
F.F.L

'Y Y' SECTION THROUGH STAIRS



ACCOMMODATION / STAIRCASE (two storey only) POD
GROUND FLOOR PLAN

Typical Two Storey Stair Design Requirements. (P.I.B. 14)

1. In a two storey Hospital.
   a) For mattress evacuation, turning space is required at mid landing only. See N.F.P.R. Pages 4/3 to 4/7.
   b) At the floor landing on ground and 1st floor where evacuation is in line with the staircase door opening the landing depth should be a minimum of 1000mm (clear of open door leaves).
2. Flight width 1650 o/a. Net 1550 allowing 100mm for central bannisters.
3. Mid landing Net depth 1500mm in accordance with NFPR Page 4/7 for mattress evacuation.
4. Doors to stairs to open in the direction of escape. 1900 doorset, doors to be ½ HFR, self closing, half-glazed.
5. Section of the hospital street which gives access to staircase should form a ventilated lobby to stairs. This can be achieved by locating the street subcompartment doors in a suitable position. See fig. 13. Appendix B.
6. Total rise 3900mm.
7. Minimum going 280mm ref. Building regulations and Approved Document K.
8. Maximum rise 170mm ref HTM 81/B.S. 5810.
9. 2R +G = 620.
10. Minimum height of guarding 900mm above Pitch Line of Stair flight and 1100mm above f.f.i. at landings, ref Building Regulations and Approved Document K.
11. Height of handrail 850mm above Pitch Line of flight and 1000mm above f.f.i. at landing ref B.S. 5810.
12. Handrail section should comply with B.S. 5810 Para. 9.6. Circular section handrails should comply with fig. 18. B.S. 5810.

5.7 (Ctd.) Combined Services to template and pod

(i) Smoke extract and supply make up air - all compartment doors to the hospital street will be provided with smoke extract hoods in accordance with the Nucleus Fire Precautions Recommendations Part 3 Pages 3/10-13. Supply make-up air is to be drawn from opposite courtyards to discharge at low level in the hospital street interface section. Where lifts and staircases are incorporated and penetration of the vertical ducts is necessary the supply air ductwork will need to be fire protected.

(ii) Fire Alarms - the template and pod accommodation is considered in total as a compartment and the fire alarm system will be required to operate on the basis and as defined in Section 3 Fire Alarms Page 3/2 of the Nucleus Fire Precautions Recommendations.

(iii) Doors on detents - on manual or automatic initiation of the fire alarm system all doors held open on detents within the pod, template or street interface will close.

(iv) Electrical and Medical gas isolation - total isolation of the electrical and medical gas services to the compartment (pod and template) will be accomplished from the hospital street.

5.8 Extended Template using the Pod Zone

Where non-standard templates are designed incorporating the pod zone and the fire plan is agreed with the local fire brigade for the whole compartment, sub-compartment rules for the pod may be relaxed.

P.I.B. No. 21 May 1988 - Paragraph 2.32 in new document refers

5. Fire Precautions - Air Transfer Grilles in Fire Resisting/Smoke Stop Walls

1. Introduction

The subject of passive supply air transfer grilles in fire resisting and smoke stop doors and walls was originally highlighted in Nucleus Projects Information Bulletin No. 10 dated September 1984. Reference was made in that publication to instances at several Nucleus hospitals where air transfer grilles had been installed in fire resisting construction in locations other than those which had been accepted as part of the approved Nucleus fire precautions. Regional and District Health Authorities were advised on the conditions under which air transfer grilles in a limited number of specified locations had been approved by the Home Office Fire Service Inspectorate (HOFSI) and DH, and the appropriate corrective measures to take if this provision had been exceeded. It was recognised that air transfer grilles could compromise the integrity of fire resisting construction but each case had been individually considered and in the agreed locations the risk was judged to be small.

a) grilles to be fitted with fusible link dampers of appropriate fire resistance to BS476 Part 8 1972;

b) grilles were not to exceed a maximum size of 200 x 200 mm;

c) grilles were to be located at low level within walls (not doors);

d) the room requiring the air transfer grille was to be held at a negative pressure relative to the adjacent space by a maintained continuous extract system.

Fig 1 indicates typically the agreed locations within the Adult Acute Ward template.

It was realised nevertheless that a fusible link operated fire damper would not control the movement of smoke from a low temperature smouldering fire. The Department therefore undertook to investigate how the overall performance of the composite fire rated air transfer grille might be improved.

2. Background

Where a room necessitates mechanical ventilation there must be a means of supplying and extracting the air and this is generally met from room located terminals directly ducted to active ventilation systems. Functional or environmental requirements may however often determine that either the supply or extract need not be directly ducted to the active systems. In these instances the principle of air transfer by passive ventilation becomes an intrinsic part of the overall ventilation design with airflow either into or out of the room. This air transfer can often be successfully met by normal leakage paths but where these are insufficient, conveniently located air transfer grilles are required. A contributing factor in this air movement is the relative working pressures of the adjacent spaces.

Thus two basic room situations exist:-

Case 1 - Negative condition - where a room has only a ducted extract point the air transfer grille will act as a supply point to the room by drawing air from the adjacent space (See Fig. 2) i.e. passive air supply into room.

Case 2 - Positive condition - where a room has only a ducted supply point the air transfer grille will act as the extract point from the room, exhausting air into the adjacent space (see Fig. 3) i.e. passive air extract out of the room.

3 Investigation - Test rig and Procedure

An independent NATLAS ACCREDITED Fire Research Centre was commissioned to test under simulated and actual fire load conditions the effects of low temperature smouldering fires in relation to the use of an air transfer grille. These tests were conducted within a fire test room of blockwork construction measuring 4.5m x 2.9m x 2.2m high having a

single inward opening door and separate viewing window. The test room was provided with a ducted variable volume extract system capable of maintaining a pressure differential of approximately 10 pa. between the room and adjacent space under normal conditions. The door gaps were adjusted to comply with the DH Component Data Base specification for a half hour fire rated door.

The air transfer grille assembly was mounted at low level within the 100mm blockwork wall just below the viewing window (see Fig. 4). Instrumentation monitored and recorded the room temperature at high and low level, and ambient condition, as well as the differential pressure between the room and the adjacent space.

The potential fire load of a number of rooms was considered and fire cribs were designed to provide suitable simulated fire test conditions. Actual fire tests were also conducted using bagged waste disposal material (waste, linen etc.) obtained from a Nucleus hospital adult acute disposal room.

All tests were run over a period of approximately 30 mins adopting the same procedures and extract fan operation.

4. Case 1 - Negative Condition

Composite units comprising a fusible link fire damper and pressure relief flap were tested in relation to a negative room condition. These tests confirmed that the risk of smoke spread given the conditions listed in Section 1(a) to (d) above, was minimal. They also confirmed however that a fire could develop which could cause the room pressure to increase to a positive condition without the fusible link operating to close the fire damper. Under such circmstances a reversal in the direction of flow through the air transfer grille would result, causing smoke to be emitted into the adjoining space, thus compromising the means of escape.

Consideration was given to the ways in which this air flow reversal out of the room could be prevented irrespective of the reasons for the change in the room pressure. Reversal of airflow can normally be prevented by pressure relief flaps and examples of these were tested in combination with the air transfer grille and fusible link fire damper (see Fig. 5).

These tests demonstrated to the satisfaction of the HOFSI that pressure relief flaps could effectively control smoke leakage when used in conjunction with an air transfer grille.

Smoke leakage using a pressure relief flap cannot entirely be eliminated but the emission will be minimal especially if sealing strips are provided between the flap and the return stops. The tests have also indicated that the leakage through a single flap unit is less than that from a multi-flap unit, although the performance of both types is acceptable. As the airflow rate across the pressure relief flap relies on a pressure differential, they must be provided with adjustable counterbalance weights to facilitate on-site balancing (see Fig. 6).

Tests on various types of pressure relief flap supplied by the following companies were carried out on behalf of the DH by Warrington Fire Research Centre:-

Gilberts (Blackpool) Ltd
Proheat Ltd (Hertfordshire)
Dufaylite Developments Ltd
Waterloo Grille Ltd

Although the DH have no immediate plans for approving any manufacturers' product those tested were found to have an acceptable leakage rate of less than 25 litres/min for a 5 pa differential pressure.

5. Case 2 - Positive Condition

Where air is mechanically supplied to a room and infiltrates via an air transfer grille to an adjoining space the addition of a pressure relief flap will not prevent smoke movement out of the room in a fire situation as in Case 1. Passive extract grilles would not normally be installed in fire resisting construction although there are a few special cases where they have been included. However, the performance of these units in such instances can be improved if they are installed with an automatic fire damper which has good smoke seal characteristics and can be activated by a room fire detector and the general fire alarm system.

In cases where the overall airflow pattern is not critical the option of a ducted extract point within the room should be considered.

6. Action

Health Authorities are asked to ensure that where air transfer grilles are to be located in fire resisting construction as specified on the agreed fire plans, their installation will be in accordance with the following:-

Case 1 - Passive Supply - that the installation meets the requirements of 1(a)-(d) inclusive and must additionally incorporate a pressure relief flap.

Case 2 - Passive Extract - that these units must incorporate an automatic fire damper with good smoke seal characteristics which can be activated by a room fire detector and the general fire alarm system.

Consideration should also be given, after consultation with the local fire brigade, to improving the overall standard of air transfer grilles in existing Nucleus hospitals in line with the measures outlined in Cases 1 and 2 above.

For further advice or information on this subject please contact Mr D Pratt DH, Health Building Directorate, Room 527 Euston Tower, 286 Euston Road, London NW1 3DN Tel 01-388-1188 Ext 3840.

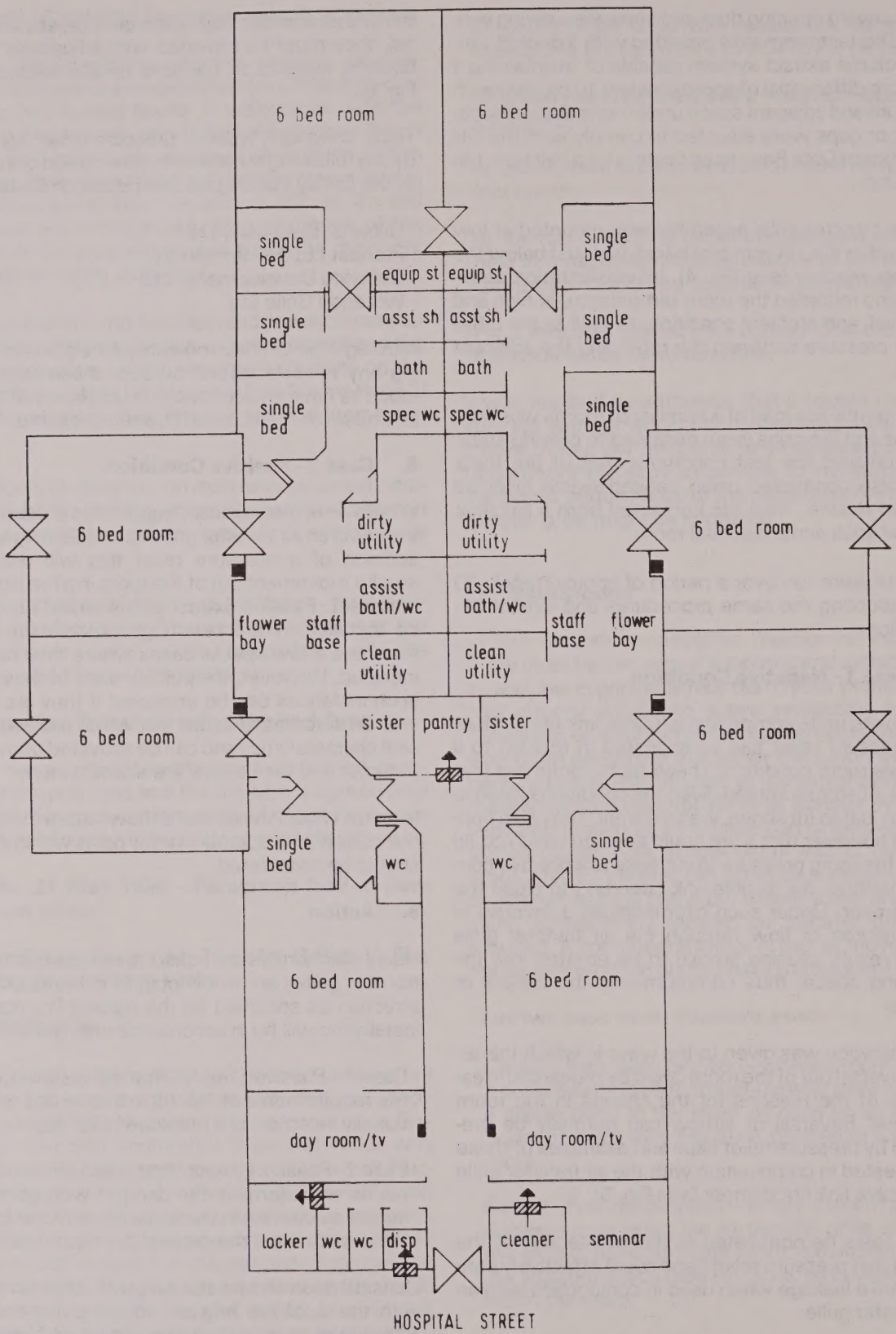


FIG 1. ADULT ACUTE WARD AIR TRANSFER GRILLES (P.I.B. 21)

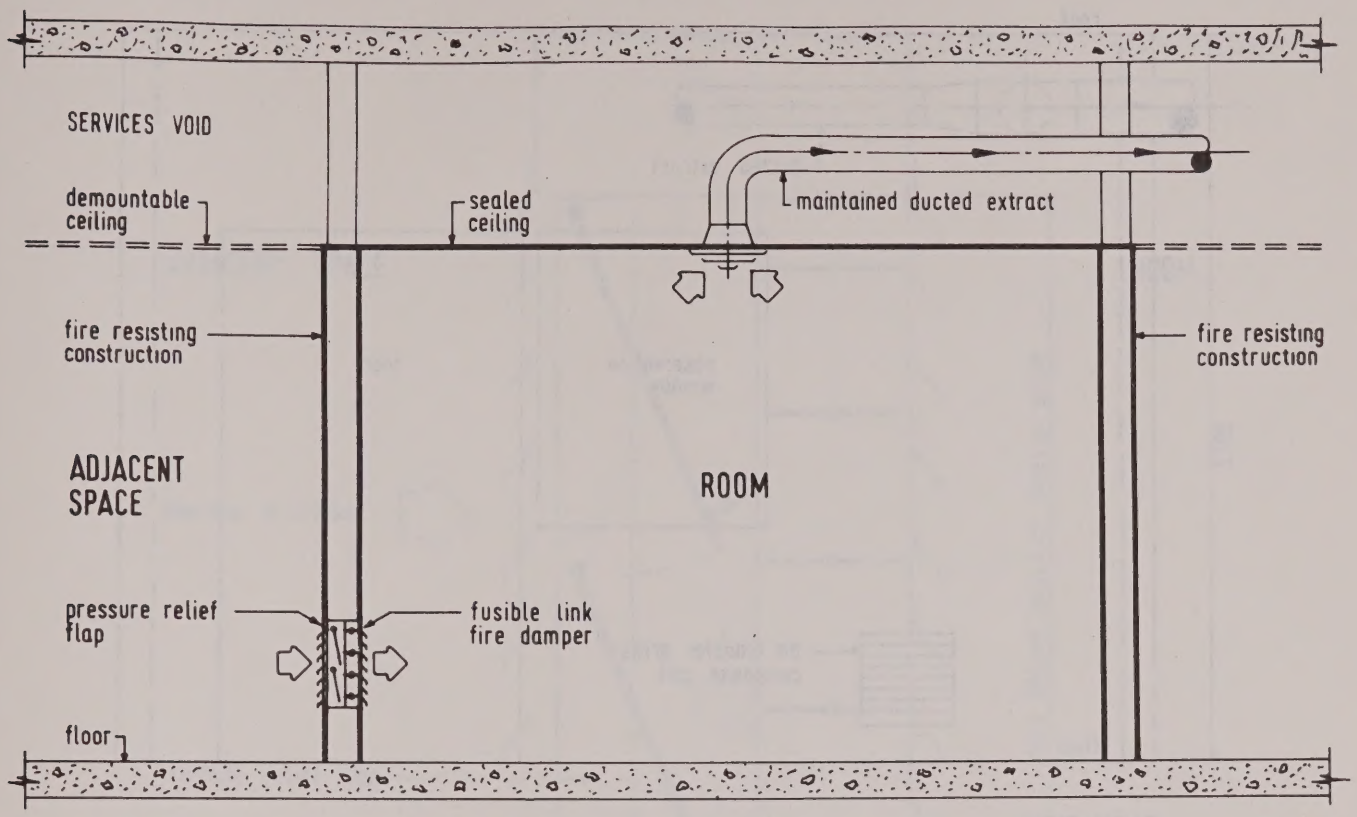


FIG 2. CASE 1 - NEGATIVE CONDITION (Passive Airflow into Room)
(P.I.B. 21)

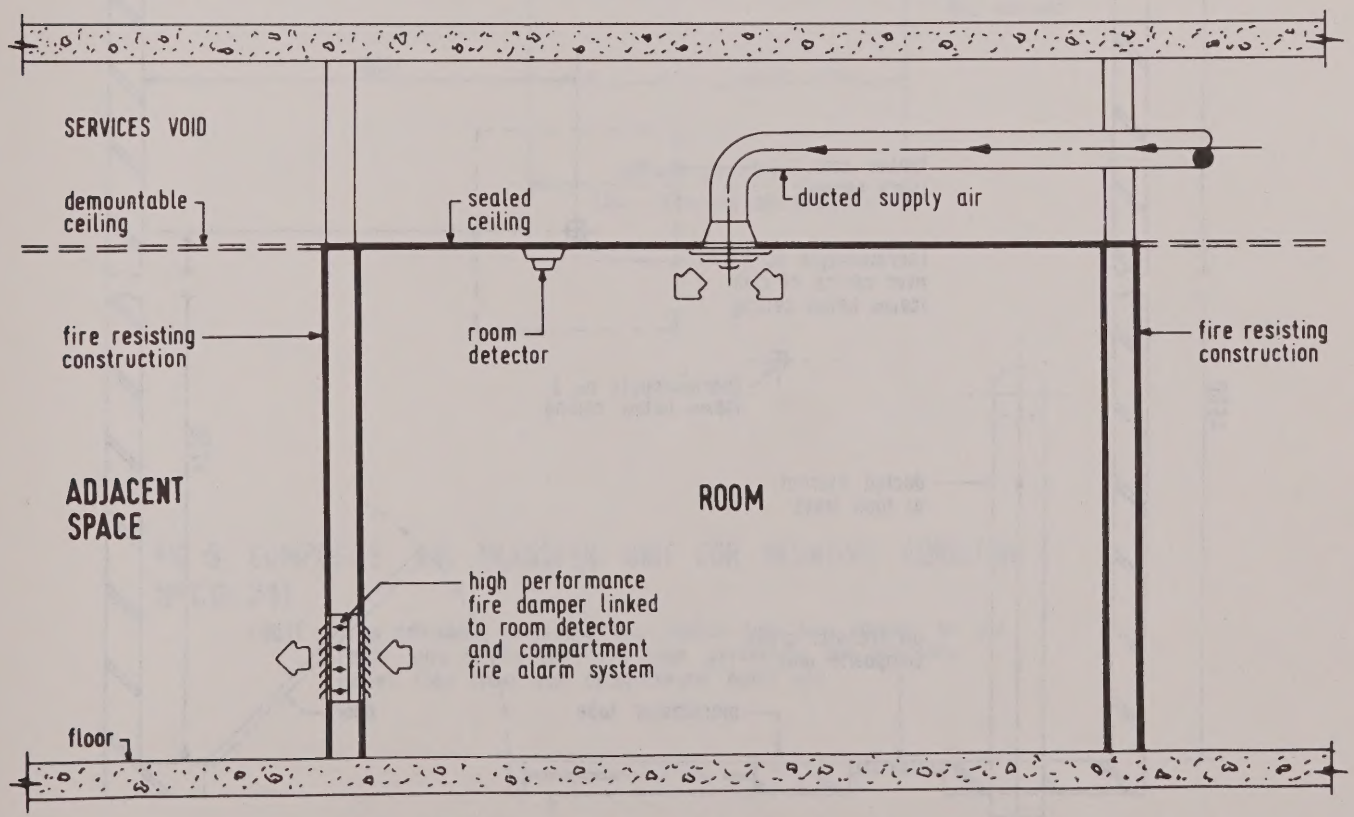
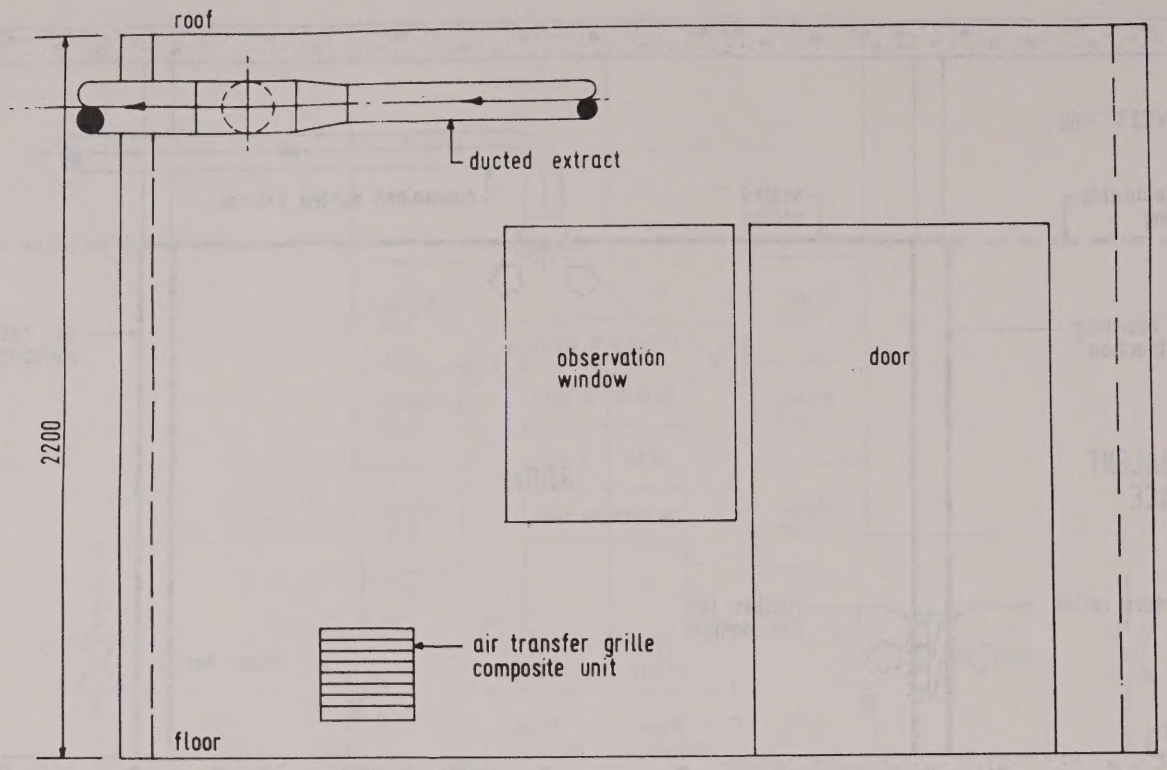


FIG 3. CASE 2 - POSITIVE CONDITION (Passive Airflow out of Room)
(P.I.B. 21)



ELEVATION

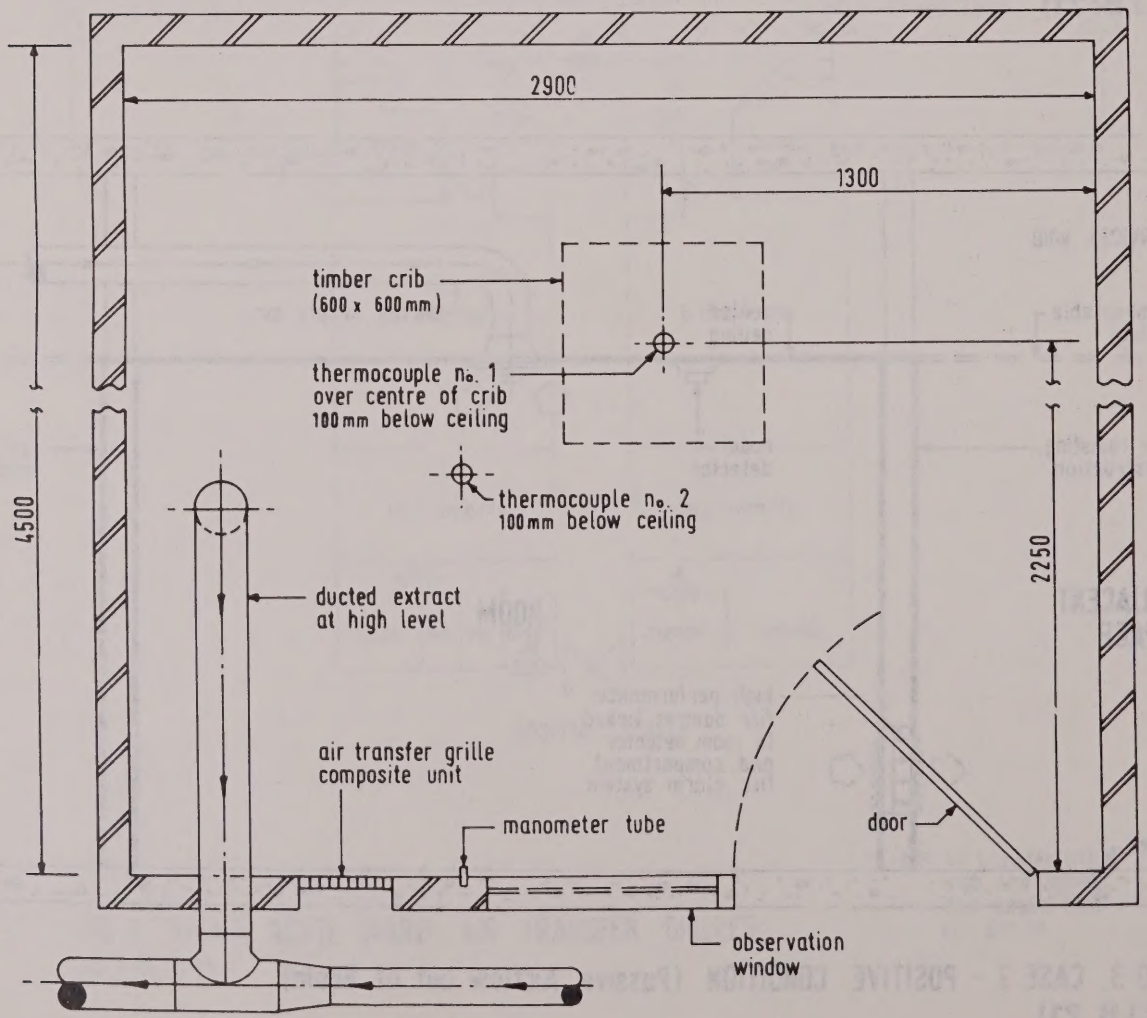


FIG 4. TEST ROOM (P.I.B. 21)

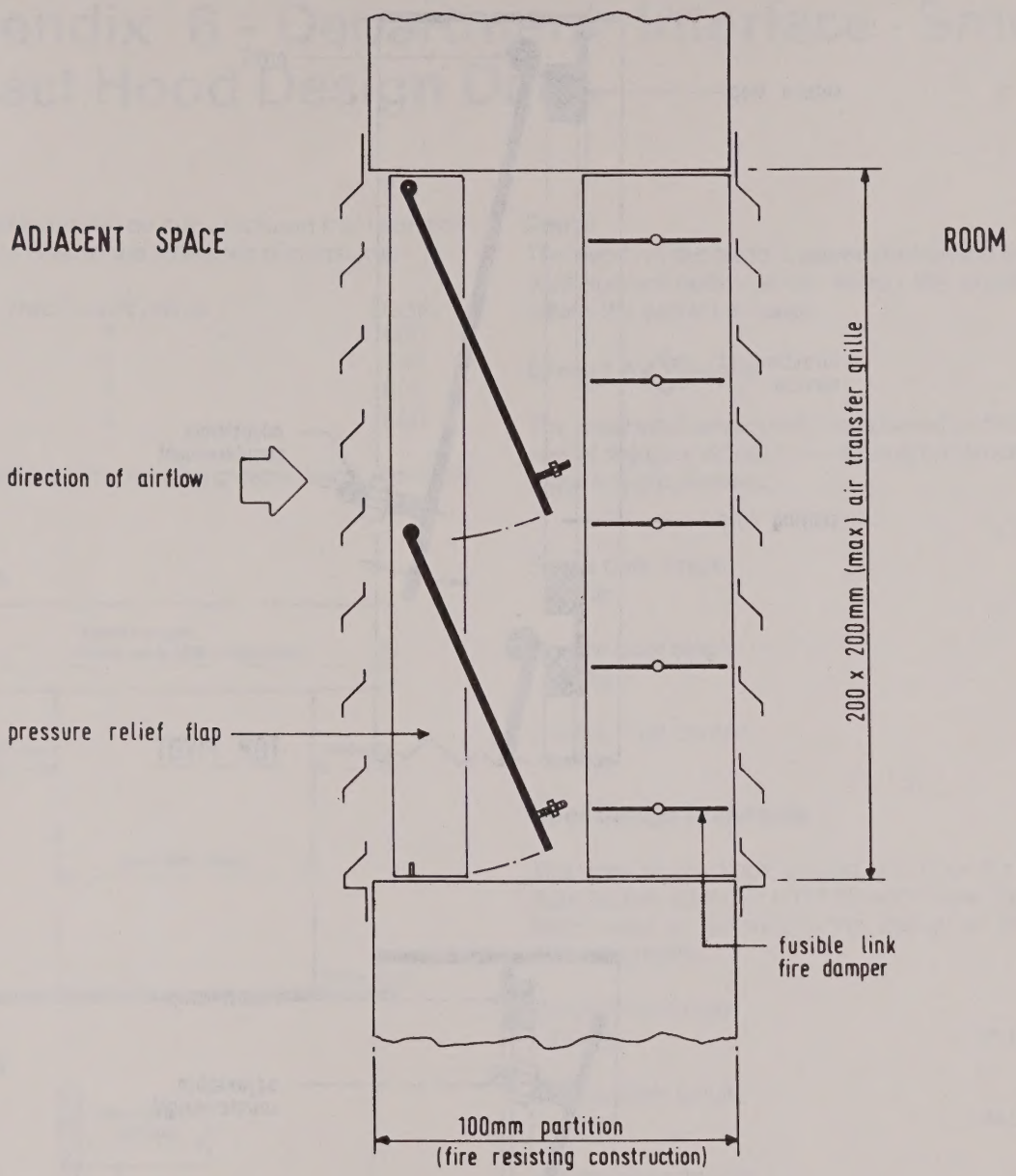
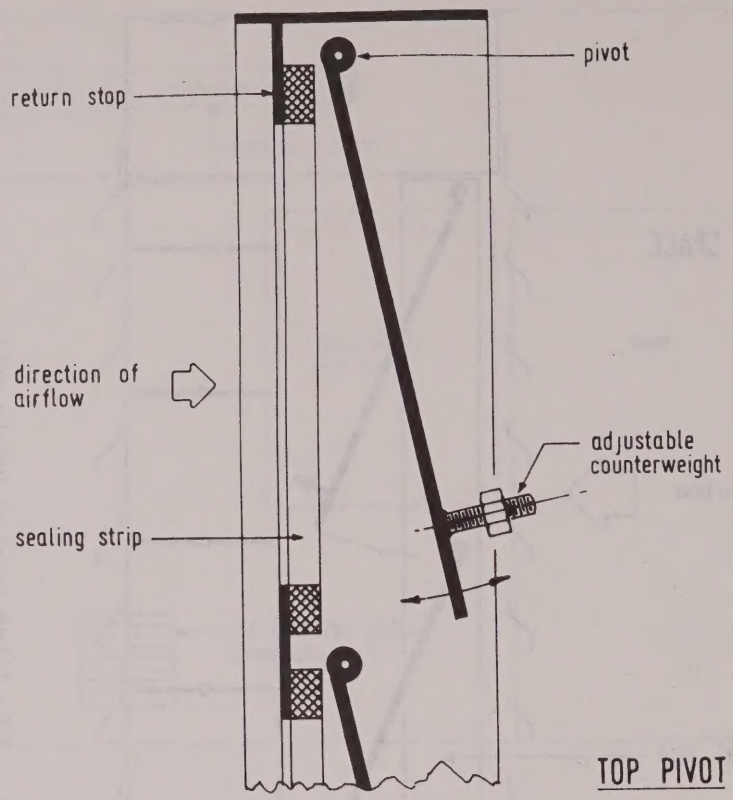


FIG 5. COMPOSITE AIR TRANSFER UNIT FOR NEGATIVE CONDITION (P.I.B. 21)

(NOTE : It is advisable to locate the fusible link fire damper on the room side of the partition thus protecting the pressure relief flap from any temperature build up)



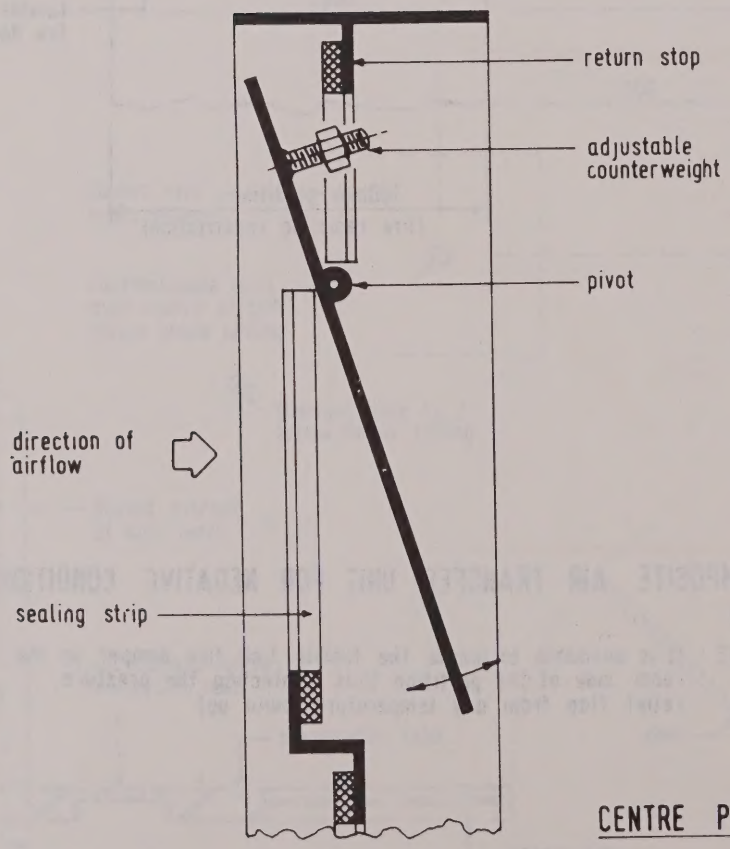


FIG 6. PRESSURE RELIEF DEVICES (Detail of Seal Between Flap and Return Stop) (P.I.B. 21)

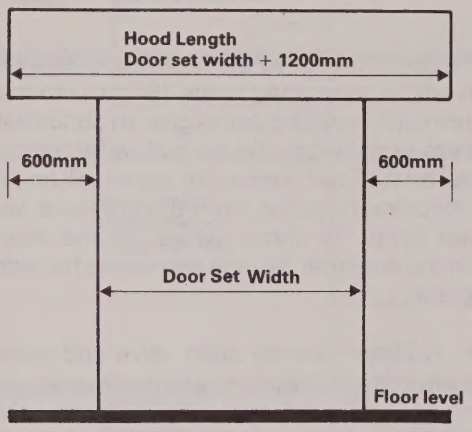
Appendix 6 - Department Interface - Smoke Extract Hood Design Data.

The extract hood will be manufactured from non combustible material to the following dimensions:-

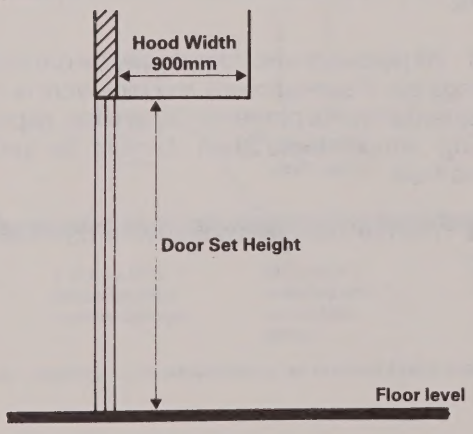
No of outlet points	Depth
1	900
2	700
3	600
5	500

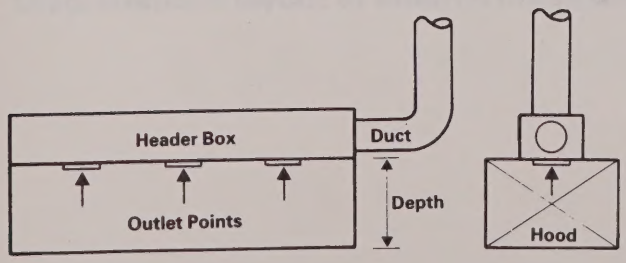
No two outlet points must be greater than 1.8 m apart.

Length



Width





Depth

The depth of the hood is dependent on the number of well spaced outlet points within the hood through which the extract is taken.

Extract Air Volume

The hood total extract volume is based on the type and size of the door which it serves in accordance with the following parameters:-

	m^3 /second
Single door single swing	= 0.15
Double door single swing	= 0.50
Double door double swing	= 1.20

Door Design Standards

The area of crackage around one hour fire resisting door sets is stated in HTM 58 and these figures have been used to determine the design of the smoke extract system.

Single door single swing	= 0.0032m^2
Double door single swing	= 0.0113m^2
Double door double swing	= 0.0289m^2

These areas were used along with smoke (gas) temperature of 100°C on the fire side of a closed door and a pressure differential across the door of 2mm water gauge to determine actual extract volumes.

Appendix 7 - Internal Fire Hydrants and Mains

A7.1 An internal fire main will be provided within the interconnecting hospital street, and this will feed a 65mm fire main hose connection by the entrance of each template and hospital street interface and at each floor level. It is recommended that this fire main should be permanently charged with water, but not directly connected to a water supply main.

A7.2 The horizontal fire main connecting the inlet positions to the riser and dropper pipe is to be run in the ground floor ceiling void. The main distribution pipe is to be 150mm diameter. The riser and dropper pipes are to be 100mm diameter and of the same material as the main distribution pipe.

A7.3 The horizontal fire main will have a minimum of two inlet positions which will be within 20m of an external hydrant.

A7.4 Each inlet position will consist of an inlet manifold with three (3 Nos.) valved 65mm firemans male hose connections, a 150mm diameter gate valve locked with leather thong in shut position and a 150mm diameter non-return valve. The hose connections should NEVER be capped. The inlet pipework arrangement will be contained within a purpose made weatherproof enclosure, and it is desirable that a drainage gully be located nearby. The enclosure will have a suitable glass door marked in red 75mm letters "Internal Fire Main". A permanently engraved notice should be fixed in a prominent position inside the inlet enclosure stating that the 150mm gate valve should be in the "shut" position unless pumping through the 3 Nos. hose connections is taking place.

A7.5 No other valves will be installed on the fire main between inlets and outlets.

A7.6 The outlets in each departmental interface section of the hospital street will consist of a 65mm gate valve, locked with leather thong and 65mm fireman's female hose connection. These will be contained in a purpose made enclosure with glass door being marked in red 75mm letters "Fire Main Outlet". Outlets above roof level of the hospital street will also be provided to serve plantrooms.

A7.7 It is recommended that the system should be filled via a 20mm heavy grade pipe from a separate cold water storage cistern (at roof level) with a 20mm gate valve and two 20mm non-return valves, in series, incorporated in the pipelines. This pipe should feed to the nearest of the risers. The filling valve should normally be in the shut position, and opened only during "filling period". The valve should be in an easily accessible location, and be indelibly labelled "Fire Main Filling Valve". A small bore 6mm internal diameter open vent pipe should be connected to the filling pipe below the non-return valves and run to discharge into the cold water storage cistern for the system. Excessive build up of pressure within the internal fire main due to an increase in temperature after initial filling will be relieved through the vent pipe.

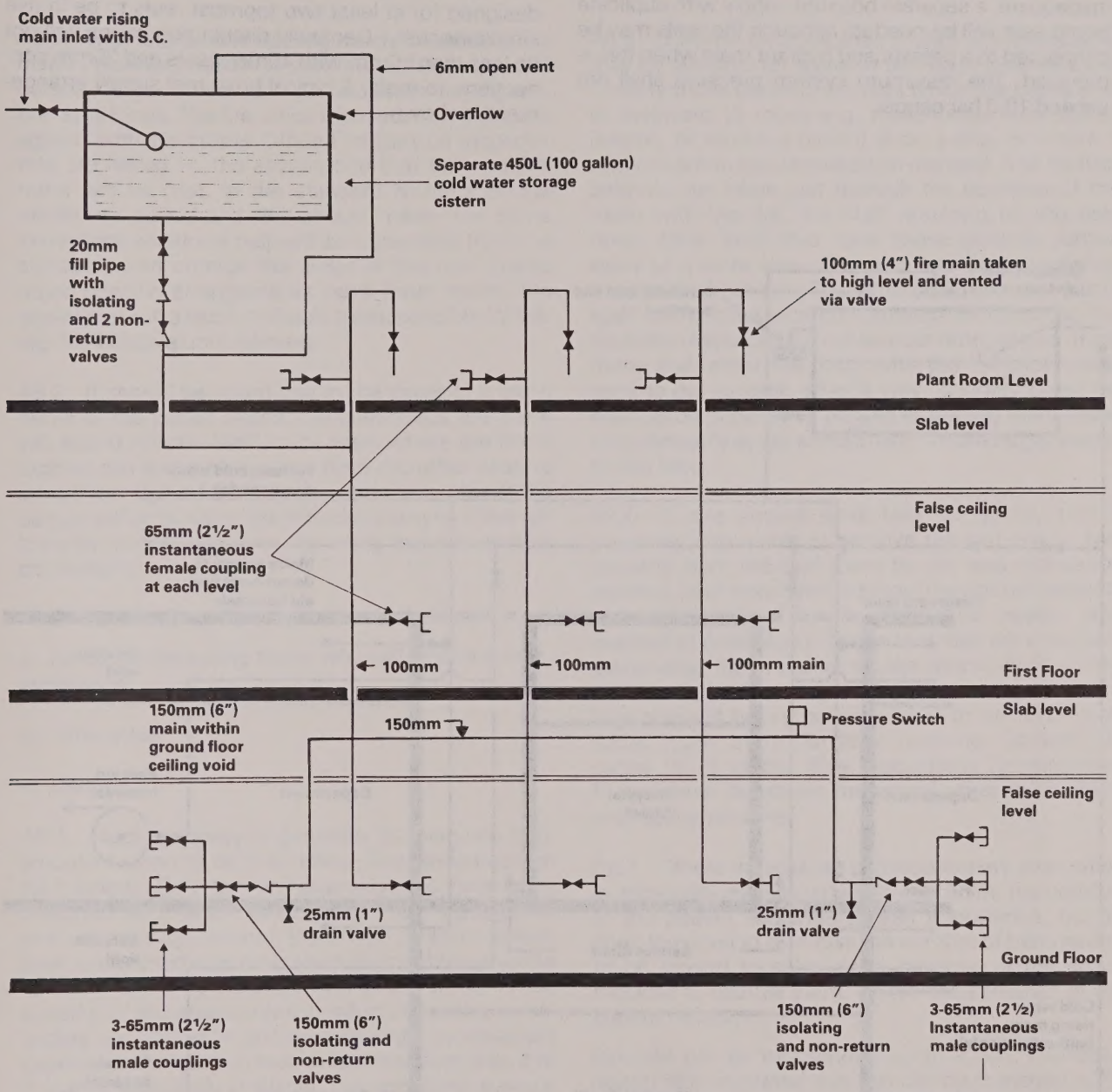
A7.8 For air venting of the pipework system a 10mm diameter short air release pipe will be run from the highest point of each riser to an air relief valve situated at a convenient and accessible level. The air relief valve will normally be kept in the shut position and opened only at the time of 'filling and venting' the system.

A7.9 At a point near to the fire main inlet a pressure switch will be connected to the 150mm fire main. The pressure switch will be set to give an abnormal condition alarm signal when the normal water pressure has dropped by 0.35 bar. The alarm signal will be provided by an electrical impulse, from the pressure switch to indicator lights, to show 'white' on the instrument panel in the engineer's office and on the fire alarm indicator panel.

A7.10 A 20mm branch drain valve and hose union will be provided at the necessary positions to facilitate draining the pipework system. The drain valves will normally be kept in the shut position and opened only in the case of draining the pipework system for repairs.

A7.11 All pipework should normally be run inside the buildings but if exceptionally any pipework is open to the external atmosphere or otherwise exposed to freezing temperatures then it must be protected against frost.

A7.12 The fire main will comply with BS 5306 Part 1 · 1976


Cold water rising main inlet with S.C.
6mm open vent
Overflow
Separate 450L (100 gallon) cold water storage cistern
20mm fill pipe with isolating and 2 non-return valves
100mm (4") fire main taken to high level and vented via valve
Plant Room Level
Slab level
False ceiling level
65mm (2½") instantaneous female coupling at each level
100mm
100mm
100mm main
First Floor
Slab level
150mm (6") main within ground floor ceiling void
150mm
Pressure Switch
False ceiling level
25mm (1") drain valve
25mm (1") drain valve
Ground Floor
3-65mm (2½") instantaneous male couplings
150mm (6") isolating and non-return valves
150mm (6") isolating and non-return valves
3-65mm (2½) Instantaneous male couplings

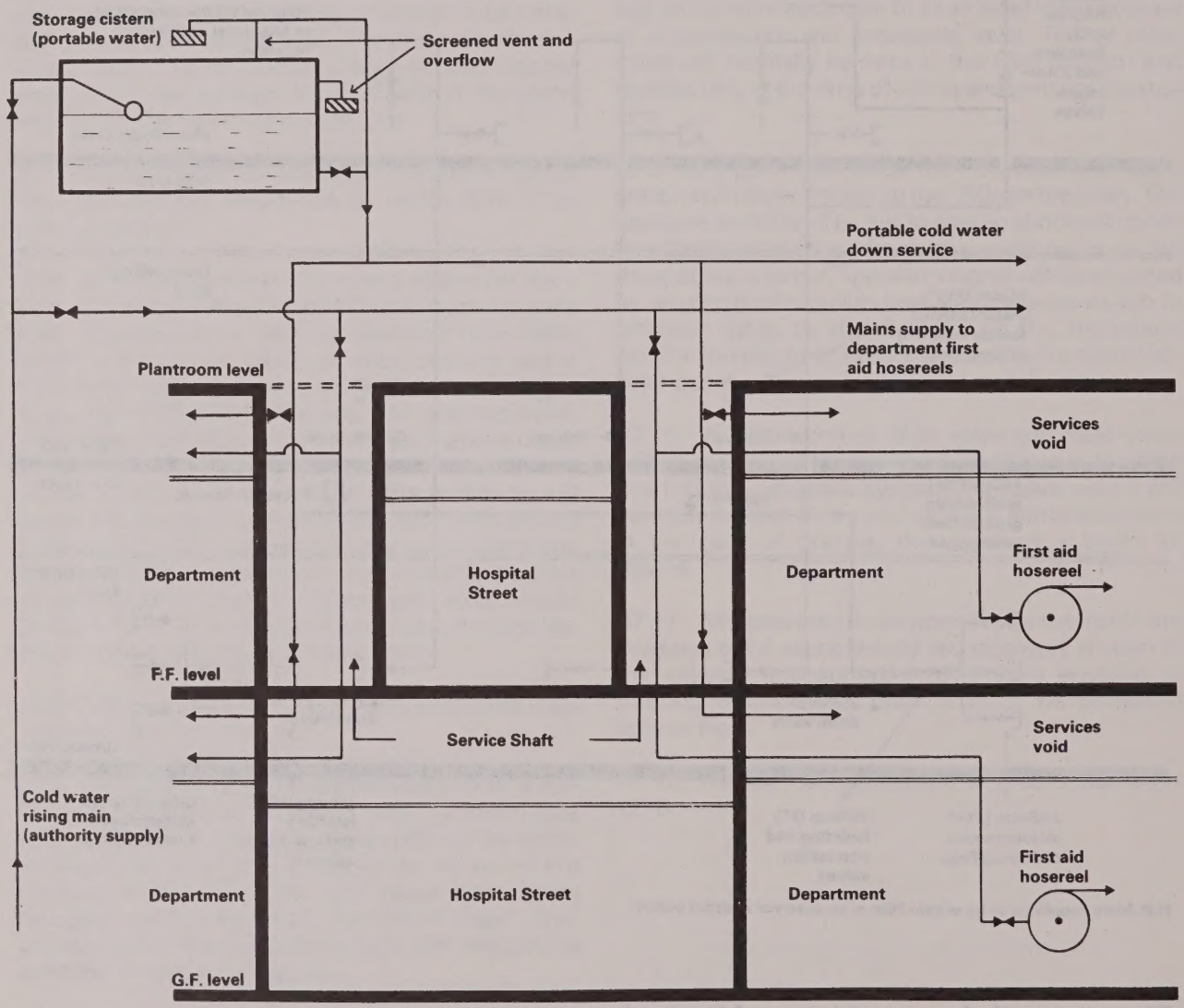
N.B. Male couplings to be within 20m of an external hydrant outlet.

Diagrammatic layout of internal fire hydrant system

Hose Reels

A7.13 The water pressure available at any hose reel must not be less than 1.25 bar gauge with a flow rate of 0.571/s. Ideally, hoses should be connected to the incoming cold water supply main for the site. If this is inadequate, a separate boosted supply with duplicate pump sets will be needed, although the reels may be connected to a pressurised hydrant main when this is provided. The maximum system pressure shall not exceed 10.0 bar gauge.

A7.14 The hose should be 19mm internal diameter in accordance with BS3169 (1970) having a 6.35mm nozzle preferably of the "twist-grip" type. Each hose reel should be connected as a branch of the supply with its own stopcock, the mechanical arrangements being such that the hose cannot be "run-out" without the water being turned on. The installation should be designed for at least two topmost reels to be in use simultaneously. Generally distribution mains will not be less than 50mm with 40mm risers and 25mm connections to reels. A typical hose reel supply arrangement is shown.



Diagrammatic layout of water supply to first aid hosereels

Appendix 8 - Fire Evacuation/Staffing Requirements.

A8.1 The medical and nursing needs of patients in a district general hospital require that a minimum of 2 nurses are on duty for each 28-bed acute nursing section at all times. The fire precaution recommendations agreed with the Home Office Fire Service Inspectorate are based on the assumption that that requirement will be met. In the standard Nucleus design wards are paired and this should mean that some immediate additional help will be obtainable from the adjacent ward outside the ambit of the fire. Unless other specific arrangements have been made, the senior nurse in a section should be responsible for taking the initiative until relieved.

A8.2 It should be noted that in the event of a fire in either of the paired wards, the continuous fire alarm will sound in both. Staff in the ward where the fire is located can summon a nurse from the other ward to advise her of the fire's location and the extent of the danger either by using the intruder alarm or, if the call transfer switch is thrown, by using the nurse/nurse call system.

A8.3 Patients may be categorised as follows:-

a) Ambulant (including those who will require some assistance)

b) Wheelchair

c) Bedfast

A8.4 Nucleus policy is generally to evacuate non-ambulant patients on their beds. (But see paragraph A8.6 below). Corridors and doorways etc. have been designed to a width sufficient to meet emergency evacuation requirements. Beds with poles or Balkan Beams attached may have to be lowered however so as to avoid fouling the top of the door frames. When speed is of the essence and comfort of patients a secondary consideration (extreme emergency situation) experience has shown that where there are only 2 or 3 staff immediately available, the speediest evacuation of a 6 bedded room may be achieved if:-

(i) The staff take one bed each and evacuate the patient to the nearest temporary holding area;

(ii) Patients remain in their beds unless they are sufficiently ambulant and capable of making their own way to safety quickly i.e. patients are not moved from their beds into wheelchairs etc;

(iii) Frail patients already out of bed are placed on another bed for evacuation two to a bed (unless they happen to be in a wheelchair at the time of course). Evacuation two to a bed may also be appropriate if a bedfast patient has set his bed on fire i.e. he is moved onto the adjacent bed.

A8.5 If however more than 3 staff are available, it may be sensible for some to pair up to evacuate particularly those patients on beds which are heavy and/or awkward to move e.g. those fitted with Balkan Beams, or where a patient is on a drip, or where 2 patients are to be evacuated on one bed. If all bedfast patients are taken just through the doorway of the room with the fire, the staff returning for the next ones, other staff then take those patients further away to a safer area, thus also avoiding congestion outside the bedroom. The importance of a member of staff taking charge of the situation and directing the available resources cannot be over emphasised. If too many staff enter the room with the fire they would tend to get in each other's way, possibly delay the evacuation of patients, as well as putting themselves unnecessarily at risk should toxic smoke be generated by the fire.

A8.6 If the smoke level falls so quickly that it becomes impossible to remove the last one or two patients from the bed room by the bed evacuation method, staff may have to stoop low and pull patients out over the floor by the blanket or pyjama drag method of evacuation. These methods are physically demanding, but in severe smoke conditions they may be the only feasible way. Even these methods may be impossible if heavy patients have to be taken over some types of textile floor covering. Section 3B, pages 65-71 of the 'Fire Precautions Development Programme' illustrates these and other methods of evacuating patients.

A8.7 Where emergency or precautionary evacuation is necessary and speed is less important, the comfort of the patient assumes greater importance; but so does the need to minimise the number of beds having to be moved to safer areas because of the space required to receive them. Where the condition of the patient allows:-

Patients can be evacuated two to a bed, exercises having demonstrated that this can be managed without undue difficulty even over carpeted flooring; but it is tiring for one nurse to move many beds like this. Care also needs to be exercised so that arms or legs of the second patient do not overhang the side of the bed, particularly when negotiating doorways and corners.

Patients can be moved from bed to wheelchair or commode, but this may require 2 nurses for the transfer.

Patients able to walk can move away to a safer place either under direction or with assistance.

A8.8 In extreme emergency fire situations the sequence of movement of patients is:-

(i) those in immediate danger;
(ii) ambulant patients;
(iii) the remaining non-ambulant patients.

A8.9 Moving patients from ITU must inevitably be hazardous. The department is therefore contained within a one hour fire compartment. However with the high level of staffing, it is improbable that a fire would take hold within the ITU.

A8.10 In the operating department, theatres are "paired" into two half hour sub-compartments to minimise the possible need to evacuate a patient undergoing surgery.

A8.11 The extent of the problem of evacuation will also vary according to the type of patient. A list of departments and the average number of beds contained in each, together with an approximate breakdown of the mobility of patients who might be in that department or unit at any one time is given below (see however paragraph A8.7 above, last sentence):-

a. Adult Acute Nursing Section 28 Beds

Bedfast	14
Chairbound	6
Assisted ambulant	4
Ambulant	4
	28

b. Geriatric 24 Beds

Bedfast	6
Chairbound	6
Assisted ambulant	6
Ambulant	6
	24

c. Children 24 Bed/Cots

Cots	6
Bedfast	6
Ambulant	12
	24

The number in beds/cots could be doubled up for evacuation

d. Orthopaedic 28 Beds

Bedfast	10
Chairbound	8
Assisted ambulant	4
Ambulant	6
	28

e. Psychiatric 30 Beds

High dependency patients	2
Ambulant	28
	30

Bibliography

Fire Related Documents

FIRE PRECAUTIONS ACT 1971

FIRECODE published by DH as indicated below:

Directory of Fire Documents
ISBN 0 11 321108 2 November 1987

Policy and Principles
ISBN 0 11 321109 0 November 1987

Health Technical Memoranda (HTM):

HTM 81 Fire Precautions in New Hospitals
ISBN 0 11 321082 5 November 1987

HTM 82 Alarm and Detection Systems
ISBN 0 11 321099 X ⋆

HTM 83 General Fire Precautions
ISBN 0 11 321100 7 ⋆

HTM 84 Fire Precautions in New Old Peoples Homes
ISBN 0 11 321101 5 ⋆

HTM 86 Assessing Fire Risk in Existing Hospital Wards
ISBN 0 11 321103 1 November 1987

HTM 87 Textiles and Furniture
ISBN 0 11 321104 X ⋆

HTM 88 Fire Precautions in Unsupervised Group Homes
ISBN 0 11 321105 8 ⋆

Fire Practice Notes (FPN):

FPN 1: Laundries
ISBN 0 11 321110 4 November 1987

FPN 2: Storage of Flammable Liquids
ISBN 0 11 321111 2 November 1987

FPN 3: Escape Bed Lifts
ISBN 0 11 321112 0 November 1987

FPN 4: Kitchens
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FPN 5: Boiler and Incinerator Rooms
ISBN 0 11 321114 7 ⋆

FPN 6: Laboratories
ISBN 0 11 321115 5 ⋆

Draft guide to Fire Precautions in Hospitals published by Home Office.

Fire Precautions Development Programme Manual.....DH

⋆In preparation

Current Nucleus Material

For comprehensive list see Project Information Bulletin No. 22 Appendix 3.

Nucleus publications included in this list which may be of particular interest to fire authorities are given below:-

Nucleus Fire Evacuation Strategy - Notes to assist fire officers

Nucleus Design. An explanation of the design philosophy.

Studies and Mock-Up Reports

No.6 Ramps and their influence on design

No.7 Materials handling: Linen and Protective Clothing

No.9 Fire Evacuation Exercises: West Cheshire Hospital July 1982

No.10 Storage and materials handling: catering - 2nd edition

No.11 Fire Evacuation Exercises: West Park Hospital, Macclesfield, October 1983.

No.17 Whole hospital policy - support services - waste disposal

No.19 Materials handling distribution services by tugs and trolleys with a ramp.

No.20 Whole hospital policy - support services - linen.

Engineering: Design Criteria

Volume 3 Engineering Briefs - Electrical, mechanical, drainage and whole hospital engineering policies.

Volume 4 Zoning and Spacing Rules - Manual showing zoning and spacing of all engineering services.

Periodic Information

Occasional Paper No 1 - Notes on Revenue Consequences of Nucleus

Occasional Paper No 3 - 'Inception to tender acceptance stage' of the Adult Acute Nursing Sections Prototype at Pinderfields General Hospital.

Project Information Bulletins.

The Nucleus material listed above is available via the Regional Contact for Nucleus material from DH, Health Building Directorate 3, Room 540, Euston Tower, 286 Euston Road, London NW1 3DN. Telephone: 01 388 1188 Extension 3501 or 3326.

Other Publications

Building Regulations 1985 and Approved Documents

Works Guidance Index

Health Building Notes No.35 Mental Illness Units
No.40 Common Activity Spaces
No.47 Health Records Department

Health and Safety at Work Act 1974

CAPRICODE

Health Technical Memorandum No.58 Internal Doorsets

British Standards

BS 476 part 8, part 22 Fire tests on building materials and structures

BS 750 Underground Fire Hydrants

BS 799 part 5 Oil Storage Tanks

BS 3169 First aid reel hoses for fire fighting purposes

BS 4547 Classification of fires

BS 5266 part 1 Emergency lighting

BS 5274 Fire hose reels (water) for fixed installations

BS 5306 parts 1,2 & 3 Fire extinguishing installations and equipment on premises

BS 5410 part 2 Oil firing

BS 5423 Portable fire extinguishers

BS 5588 part 2 Fire precautions in design and construction of buildings - Code of Practice for shops

BS 5655 part 6 Lifts and service lifts

BS 5839 Fire detection and alarm systems

BS 6262 Glazing for buildings

BS 6575 Fire blankets.

A more comprehensive list of British Standards is contained in FIRECODE - Directory of Fire Documents.

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